PRICE 50 CENTS

American Machinist

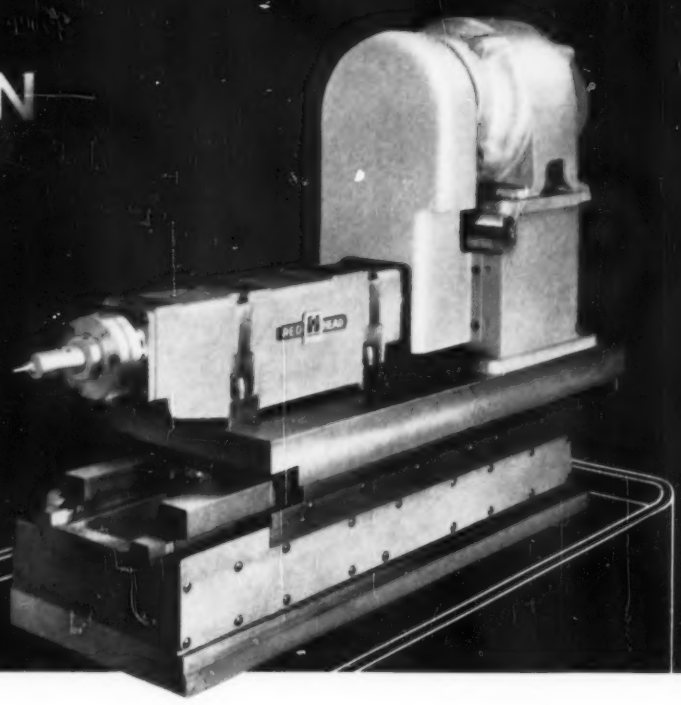
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

JANUARY 2, 1956

Ultrasonic bearing cleaner
— see page 2

Soldering Principles
Tooling for Honing
Ultrasonics — A SPECIAL REPORT

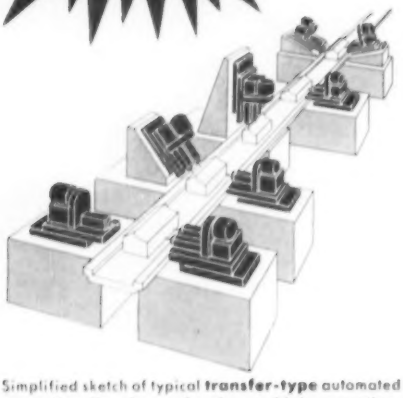
AUTOMATION SIMPLIFIED!



new

HEALD SLIDE-UNIT BORE-MATICS

permit important cost savings and give new flexibility on fully automated production lines



Simplified sketch of typical **transfer-type** automated production line for performing multiple operations on relatively large work. Setup includes horizontal, vertical and angular mounting of individual Slide-Unit machines—each a completely self-contained unit.

Typical arrangement of automatic, **conveyer-fed** production line for performing multiple operations on smaller work. Any number of identical Slide-Unit machines can be provided in each work station, to give the required overall production rate.

THESE simple, compact, hydraulically operated Heald Slide Units — each complete with boringhead and drive — are ideally suited to a wide variety of automated production lines. They can be mounted in any position from vertical to horizontal and can approach the work from any angle. This simplifies the design and operation of automatic workhandling, clamping and locating equipment — permits each work station to be arranged for the most efficient and economical operation.

In an automated line, each Slide-Unit Bore-Matic is a separate and completely self-contained machine, arranged through interlocking control circuits to function as a fully automatic segment of the entire production line. Hence individual machines can be added as required, permitting full automation to be achieved on an economical basis of planned expansion.

This new precision finishing development is another good reason why IT PAYS TO COME TO HEALD.

HEALD

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

American Machinist

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American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index

American Machinist, published bi-weekly, with an additional issue in mid-November, by McGraw-Hill Publishing Company, Inc, James H McGraw (1860-1948), Founder. EXECUTIVE, EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd Street, New York 36, NY. Donald C McGraw, President; Paul Montgomery, Executive Vice President; Joseph A Gerardi, Vice President and Treasurer; John J Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B Smith, Vice President and Editorial Director; Joseph H Allen, Vice President, Director of Advertising; J E Blackburn Jr, Vice President and Circulation Director.

SUBSCRIPTIONS: Address correspondence to American Machinist Subscription Service, 330 West 42nd Street, New York 36, NY. Allow one month for change of address. Subscriptions are solicited only from production executives and engineers in the metalworking industries. Position and company connection must be indicated on subscription orders.

Single copies, 50c. Subscription Rates — United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada $7 for one year, $11 for two years, $14 for three years. Other Western Hemisphere and the Philippines, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Second-class mail privileges authorized at New York, NY.

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NUMBER OF COPIES PRINTED THIS ISSUE 39,792

chips

ULTRASONIC CLEANER . . . Bearings are processed at 20 per minute, with total immersion time of one minute, in the ultrasonic cleaner shown on our cover. The feed mechanism will automatically load and unload, as well as process bearings through the cleaner. The latter has no moving parts in the portion of the equipment exposed to the bath, so no wear products can contaminate the solvent (Varsol No 1, an Esso petroleum derivative which prevents microscopic corrosion). Heart of the cleaner is a nickel transducer which converts electrical into sound energy, which does the cleaning. The feeding mechanism was developed by E T McGahn and Wm E Schiela, under direction of F J Donovan (shown), inspection supt, Sperry Gyroscope Company. Ultrasonic equipment was made by Alexander Murdoch Jr (see biog) who wrote our current Special Report on ultrasonics.

SOLDERING . . . W P McQuillan, of the Materials Engrg Dept, Westinghouse, has set down the fundamentals of soldering, showing how flux and solder must both be properly selected to assure good joints. He illustrates his arguments with test results, gives basic principles for sound jointing. We thought so well of it we made it our lead.

DIE BLOCKS . . . J R Paquin, in the second of his series detailing each step in designing a die, gives you a score of ideas on how to design the die block. He shows you the orderly development of the die-block features and the things to watch out for. First in this series appeared in *AM* for Dec 5 '55, and the master chart in *AM* Oct 10 '55.

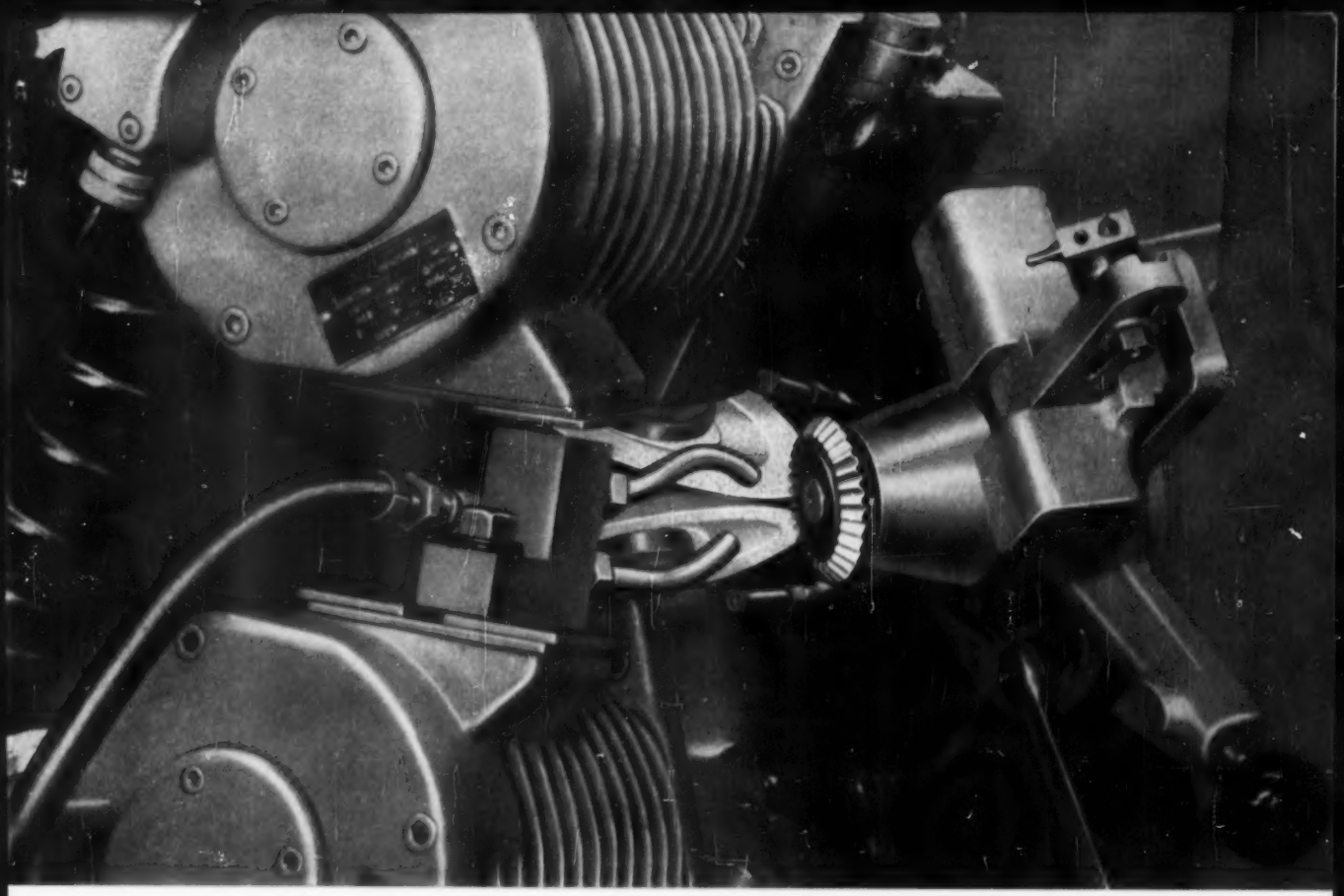
TOOLING FOR HONING . . . Production engineers of American Machine & Foundry Co, Brooklyn, wanted to do external and internal cross-hatch and draw honing in one setup. They drew up basic tooling and design for a vertical machine which Micromatic Hone built.

JOB-ORDER SYSTEM . . . When you must change setup as often as three times a day on a battery of automatics, it is important to save as much downtime as possible. Walter J Mucher, plant & production manager of Clarostat Mfg Co, Inc, tells how his company plans its production so everything is ready for quick changeovers.

SILVER PLATE . . . There is danger that glass and wire electron-tube bases will be damaged in the plating bath. Westinghouse, at Elmira, NY, uses Balcones (steel) to allow bases to slide without damage. They also conduct current and promote plating uniformity. Ralph Enyedy tells how it's done.

COMING . . . *AM* for Jan 16 will be our Annual Production Preview, reprinting in classified sections all of the descriptions of new shop equipment, materials and supplies we published during 1955. Here, in one place, are the best of what's new, properly classified for your convenient use. Here is a desk reference you should keep within reach in your current production planning—a companion issue to the Mid-November Planbook Issue. That shows new processes and methods; this one shows the equipment and materials with which to do them.

ALEX MURDOCH, Jr, author of our current Special Report on ultrasonics, has had a long and distinguished career in this field. An ME graduate of Stevens with his master's from Penn (major in vibration), he is a licensed engineer and a commander USNR. He has been a GE design engineer, developed automatic machines, has operated several companies, developed a differential analyzer, was a senior engineer with RCA in charge of developing advanced sonar ('34-'40). In the Navy ('43-'46), he was in charge of electronic installation and maintenance for BuShips Electronic Div, then was in ONR for five years. He is now a consulting engineer specializing in ultrasonics systems and applications and sonar. He is a senior member of the IRE, a member of Am Inst of Physics and Acoustical Society of America.



Now you can grind straight bevel Coniflex® gears

You can *now* use hardened and ground straight bevel gears for many angular drives requiring extreme precision and load carrying capacity.

The new Gleason No. 105 Straight Bevel Coniflex* Grinder generates gears with the highest accuracy of spacing and profile, with the tooth profile, fillet radius, and tooth bottom formed into one smooth blended shape by two grinding wheels.

And gears ground on the No. 105 Grinder after hardening *maintain their extreme precision* even under continuous load operation.

Wet-type grinding on this machine provides fast cycles and excellent finish. Set-up calculations are simple. The completely automatic cycle of the No. 105 Grinder not only assures uniformity of production but also provides great savings in time and production costs.

We will gladly send you more information about the No. 105 Straight Bevel Coniflex Grinder upon request.

The No. 105 Grinder accommodates straight bevel Coniflex gears up to 8½" pitch diameter, 3DP with ratios up to 6:1, cone distances up to 4¼". Gears 20DP and finer may be ground directly from the solid; coarser pitches are ground after semi-finish cutting and hardening.

* Straight bevel gears with localized tooth bearing.

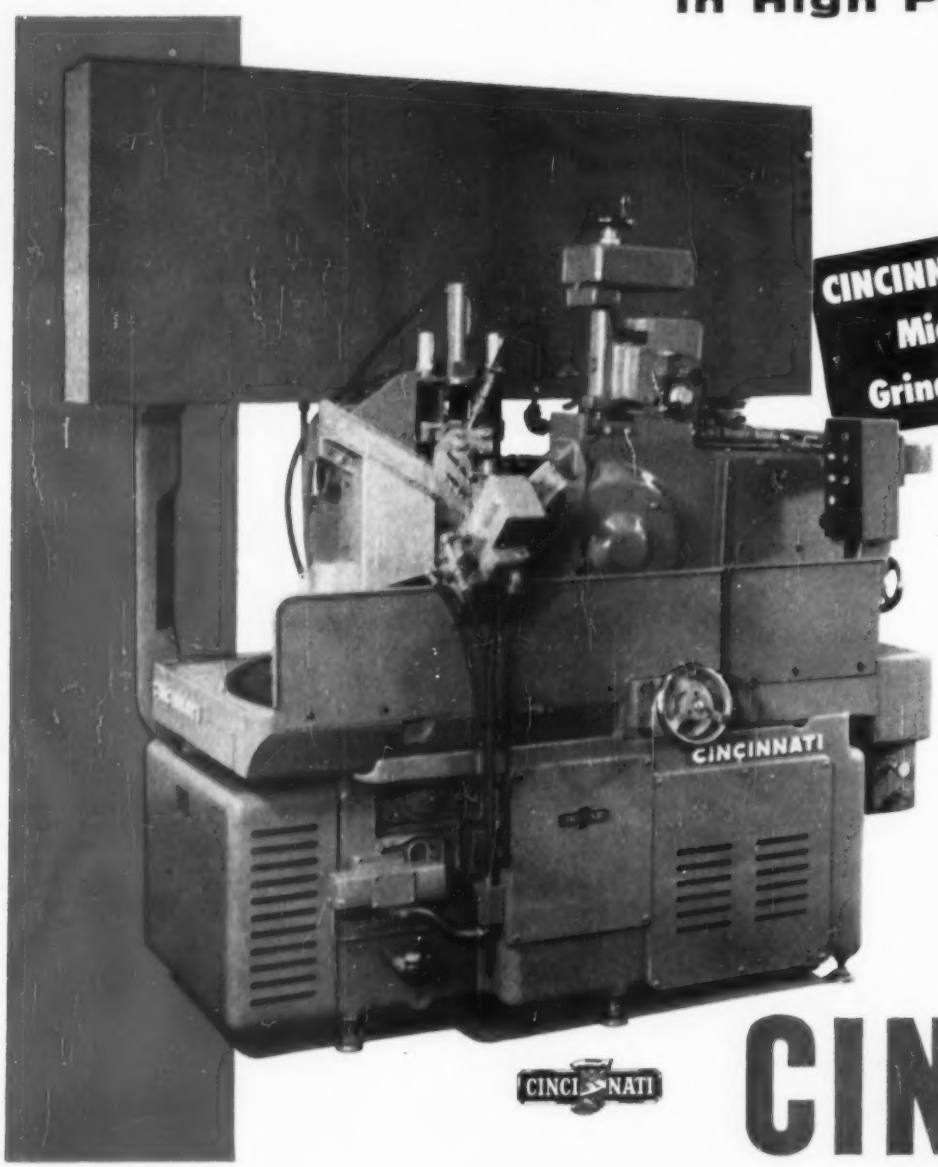
GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

The Big

In High Production



CINCINNATI FILMATIC
Micro-Centric
Grinding Machine

FILMATIC

CINCINNATI

CINCIN

News

Precision . . . NEW Micro-Centric Grinders

Everyone in high production shops is concerned with costs. And keeping costs down implies keeping up to date on all types of equipment. That's why the completely new CINCINNATI Micro-Centric is news of the first order. These new machines offer additional cost-reducing possibilities in grinding precise diameters on big volume jobs to the most exacting tolerances of roundness and squareness with one side. Here are five of the many new Micro-Centric points of interest:

NEW feed mechanism assures a higher degree of repetitive sizing.

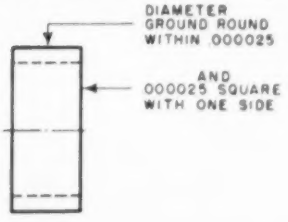
NEW drive plate. Essentially an electrically energized magnetic chuck, automatically operated from the machine cycle. Simplifies and speeds up loading.

NEW overhead electrical control panel, integrated with machine; everything completely accessible.

NEW front handwheel control for headstock slide positioning. Two speeds . . . rapid for setup; slow for sizing adjustment.

NEW and more flexible automatic loading fixture; fewer wearing parts.

This is Micro-Centric Grinding



Remember these facts about CINCINNATI FILMATIC Micro-Centric Grinders . . . they are the only grinding machines operating on the Micro-Centric principle; they produce the highest quality ground parts at very low cost; the machine can be operated manually or completely automated. Would you like to know more? Ask for catalog No. G-662. For brief specifications, look in the latest issue of Sweet's Machine Tool File.

CINCINNATI GRINDERS INCORPORATED • CINCINNATI 9, OHIO

NATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

AT THE NMTB SHOW, as in actual plant application... the Fellows Transfer Line introduced brand new concepts in automatic work handling with integrated cutting, shaving and inspection of precision pinions... completely untouched by human hands.

...and the spotlight is on *simultaneous* shaving and

on the Fellows

THE FELLOWS GEAR SHAPER COMPANY
Head office and Export Department: 78 River Street, Springfield, Vermont.
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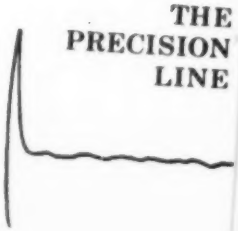
THE PRECISION LINE



Here is one continuous operation from blanks to finished pinions: hopper feeds blanks to conveyor from which they are proportioned to two No. 4GS Gear Shapers... feeds to cleaner and to Fellows Automatic Pinion Sizer... feeds OK'd pinions to deburring device... then to Fellows No. 8 Shaving Machine... and to cleaner and Fellows Automatic Pinion Checker for final inspection.

If you have need of long production runs on duplicate gears or pinions a Fellows Sales Engineer will be glad to work out with you any degree of automatic operation required.

chamfering

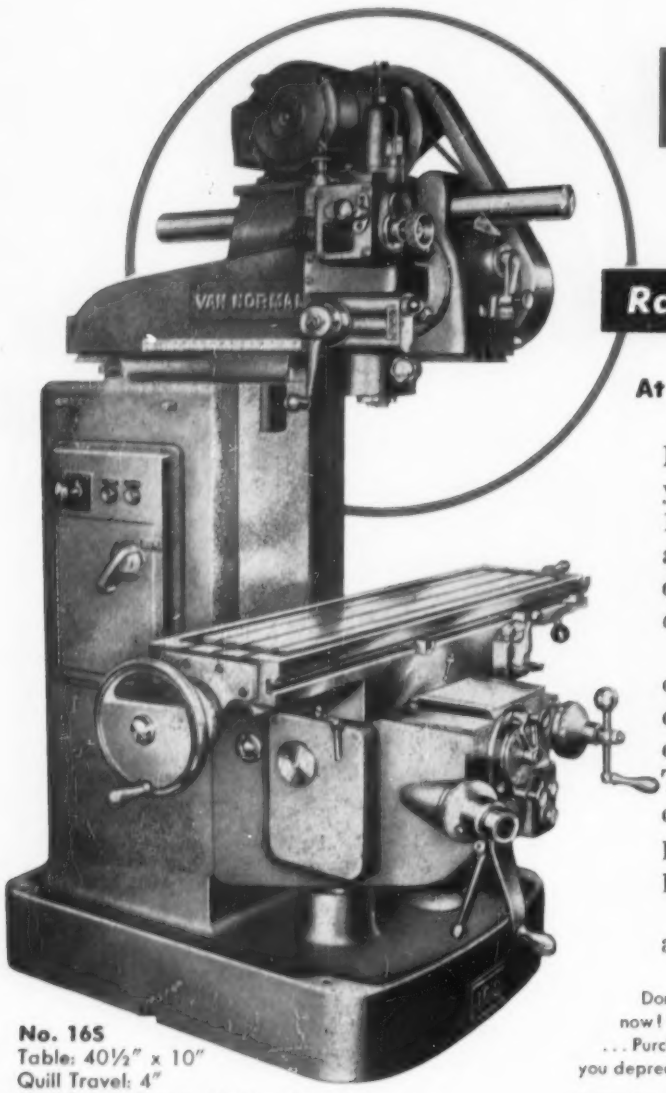
No. 8 "Full-Tool" Shaving Machine

Fellows *Gear Production Equipment*

This NEW Quill-Type Adjustable Cutterhead Mounted on the Rugged Heavy-Duty Ram makes

VAN NORMAN

No. 16S



No. 16S
Table: 40½" x 10"
Quill Travel: 4"
Quill Power Feeds: .0015; .003; .006
Spindle Motor: 2 HP

Ram Type Miller... the most

At a cost to you of only $4.98 per day*

Now for the price of a single machine you can get this New Van Norman No. 16S that gives you horizontal, angular and vertical milling, *plus* boring and drilling with the same machine *without attachments.*

The new rugged quill-type adjustable cutterhead mounted on a rugged heavy duty movable ram increases the scope of operations . . . permits maximum cuts. The No. 16S will reduce overall work completion time . . . permits greater opportunities to cut costs and increase production.

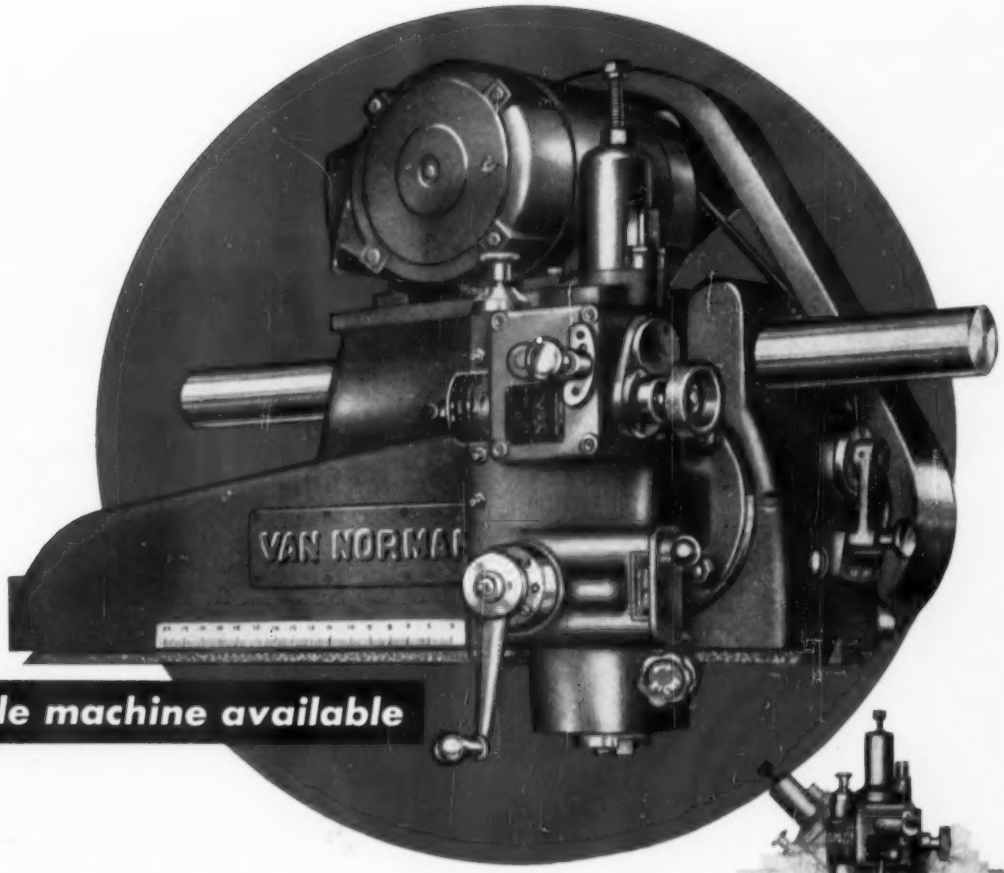
Write, phone or wire for information and catalog giving complete details.

Don't wait . . . for extra profits install a Van Norman Machine now! They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy.

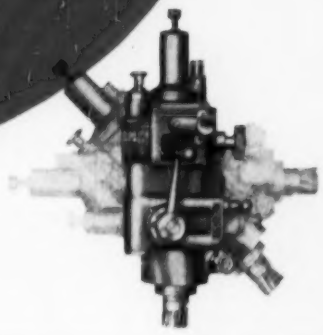
*Based on 5 year conditional sales contract. Lease and Conditional Sales Contracts not available to export.

VAN NORMAN MACHINE

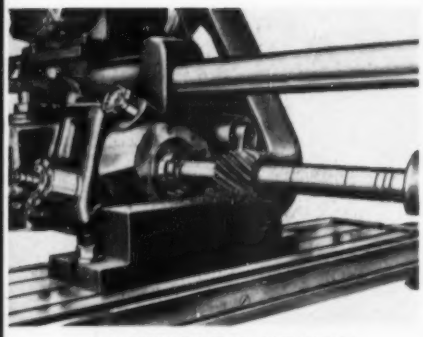
MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.



versatile machine available

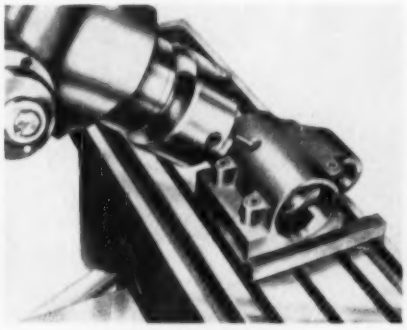


Adjustable Quill-Type Cutterhead Gives
Workability of Two Single Purpose Machines
PLUS Accurate Boring and Drilling



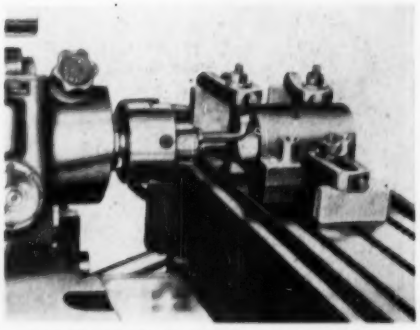
A HORIZONTAL MILLING

A horizontal milling cut performed on a cast iron base. Width of cut 2½″; Depth .25″; 3″ wide helical slab milling cutter.



ANGULAR BORING

Angular boring on a cast iron saddle bracket boring a 1″ dia. hole. Depth of bore 1¾″ removing ⅛″ stock on roughing cut. Finish cut removes .010″; Tolerance on I.D. .001″



HORIZONTAL COUNTER BORING

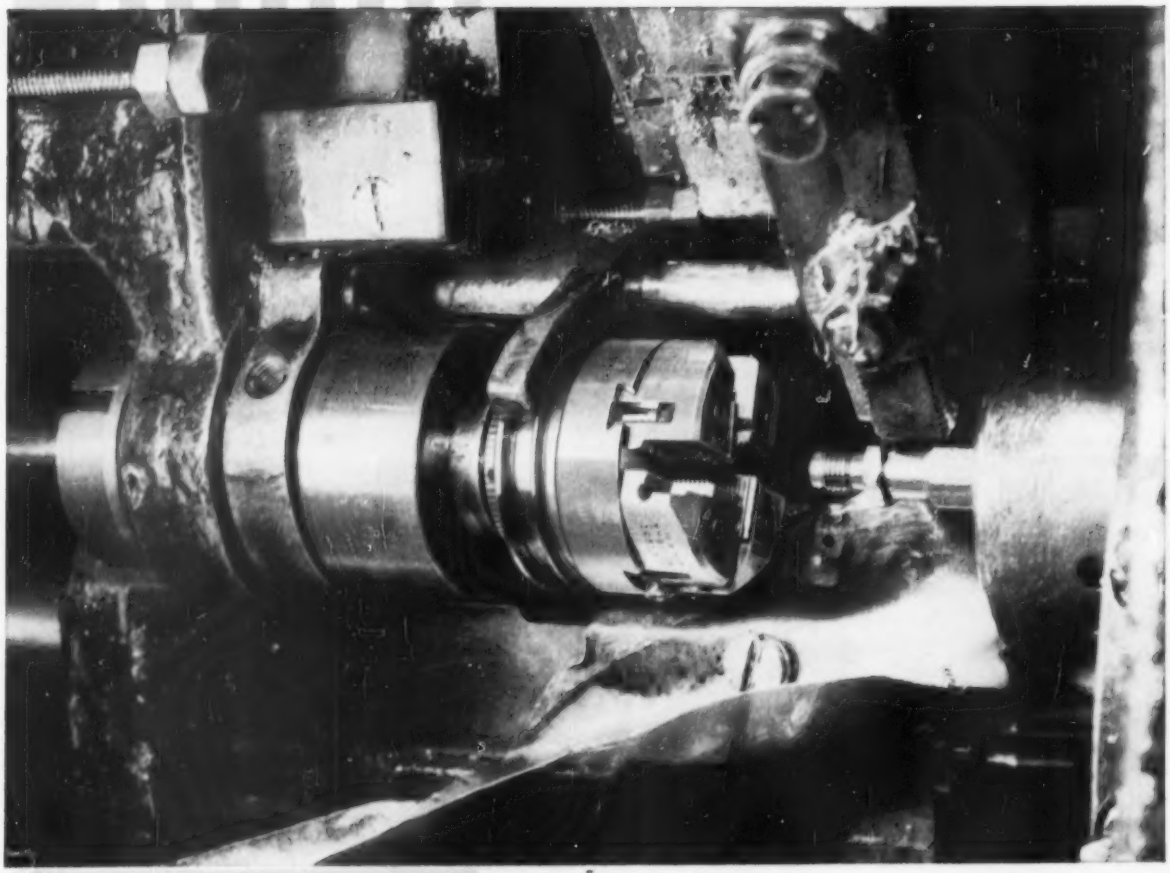
Horizontal counter boring operation of a 3″ dia. hole on same saddle bracket. Depth of cut 1″ to a shoulder removing approximately ⅛″ on rough cut. Finish cut .010″; tolerance on I.D. .001″.

COMPANY

SPRINGFIELD 7, MASSACHUSETTS

LANDIS

Economy Limited Clearance



Threading On Automatics....

To assure economy threading on automatic screw machines where limited die head clearance is a major factor Frank H. Wilson Co., Inc. in Detroit, Michigan use the ½" LL LANDEX Head. Applied to one of their small Acme-Gridley's for threading tubing nuts this head cuts ½", 20 pitch UN threads ⅜" in length on B1113 screw stock to a class three fit. An average of 20,000 pieces are threaded between chaser grinds.

Compactly designed with only a 2 7/16" swing the ½" LANDEX will thread all diameters from #4 to ½". A minimum number of working parts made of hardened and ground alloy steel, chaser holders designed to eliminate warpage and springing, and the use of precision LANDIS Tangent Chasers - - - all contribute to the high degree of rigidity and accuracy of this LANDEX Head.

Compare the chaser lengths in the illustrations and note the long life this LANDIS User has received from the chasers used in this application. These chasers will still produce thousands of threads as (1) LANDIS Tangential Chasers are usable for 80% of their original length; (2) only a few thousandths of metal need be removed from a chaser when regrinding; (3) when regrinding the same amount of metal need not be removed from each chaser; (4) long chaser life is received between grinds. These are the basis for economy in any threading operation.

For further information on this LANDEX Head and on other LANDIS Heads using Tangential Chasers and designed for all types of thread-cutting operations write for Bulletins F-80 and F-90. Please send specifications when writing.

THE WORLD'S LARGEST MANUFACTURERS OF THREAD GENERATING EQUIPMENT

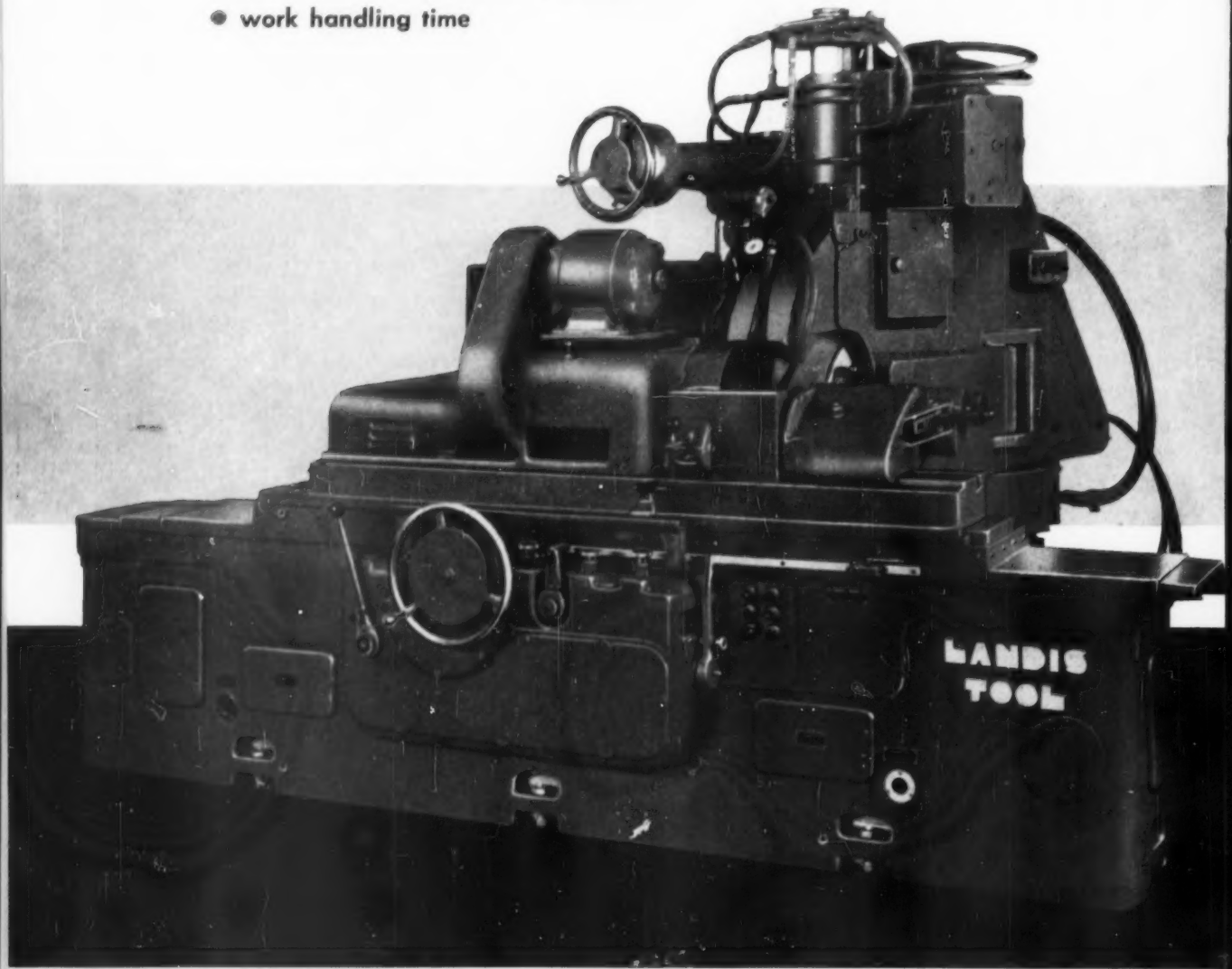
395-C

THE LANDIS *Machine* CO. WAYNESBORO PENNSYLVANIA

How to Cut Grinding Costs

This Landis engineered method saves:

- **investment in an additional machine**
- **production cost of extra operations**
- **work handling time**



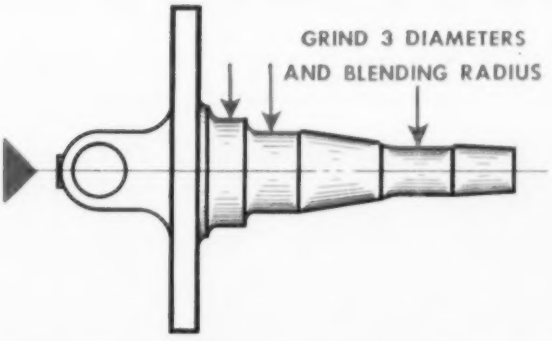
Landis 10" x 36" Type CH Plain Grinder with wheelbase set at 30°.
Overhead, hydraulically operated profile dresser.

LANDIS

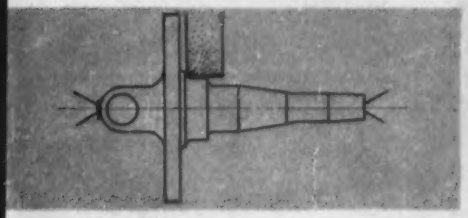
precision grinders

by Combining Operations

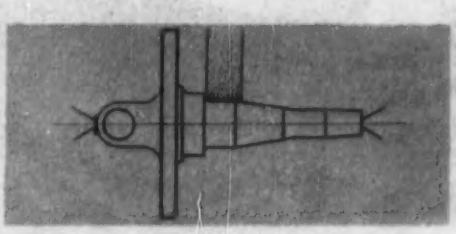
here's an example



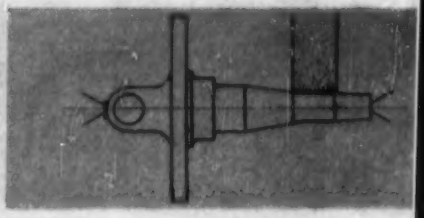
old fashioned method—3 operations



operation No. 1



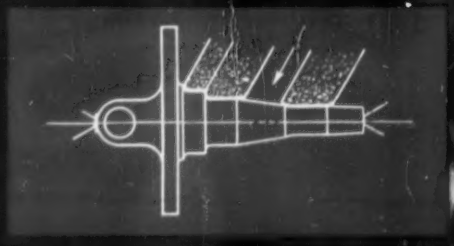
operation No. 2



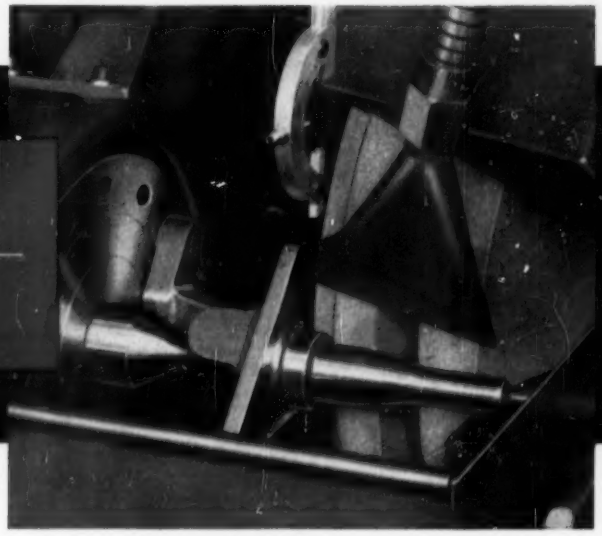
operation No. 3

modern method

Landis angle wheelbase grinding



only 1 operation!

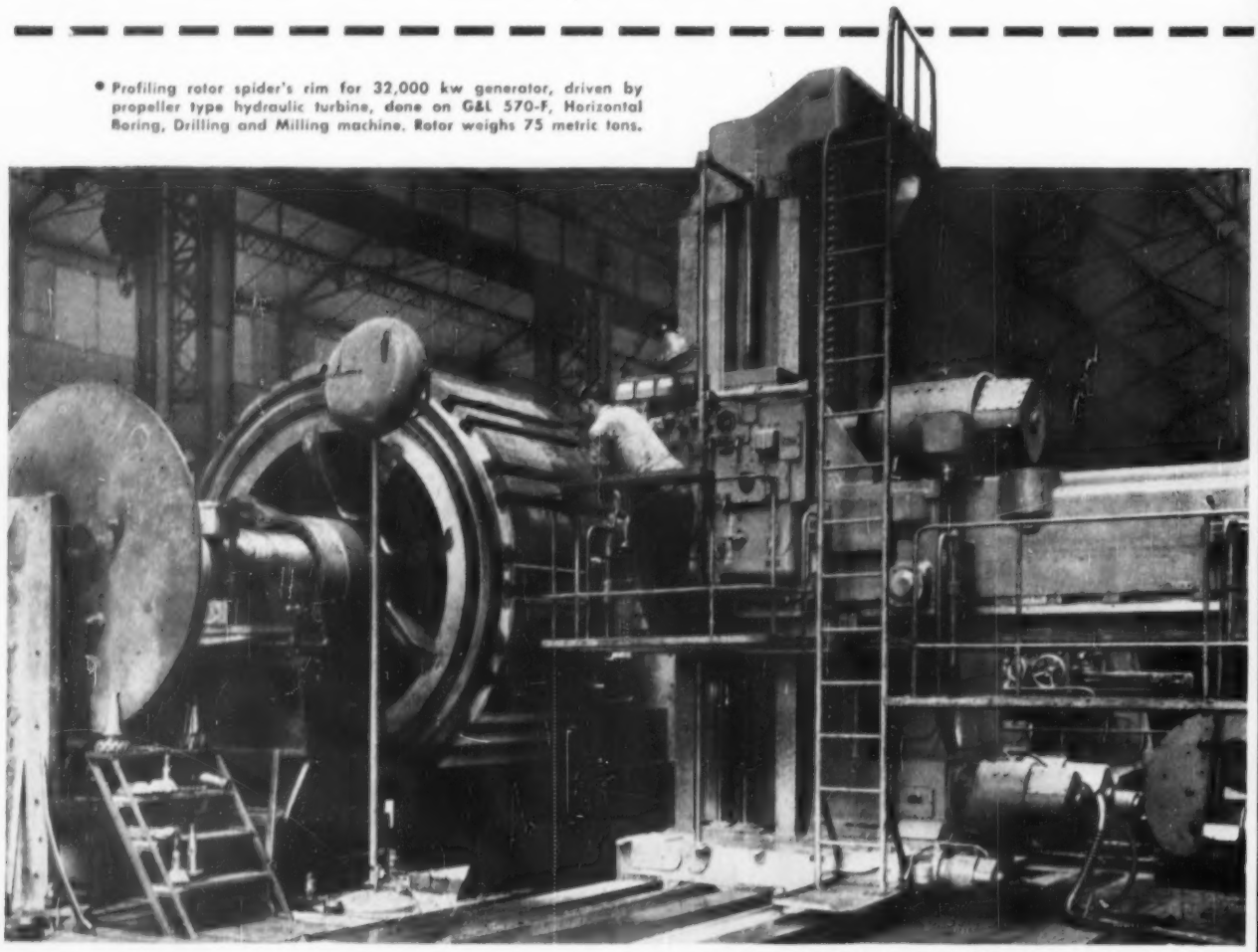


Three Diameters and Three Blending Radii of front wheel spindles are ground in one operation. Grinding is performed with spaced wheels on a wheelbase set at 30° angle. Stock removal is .015" on diameter and .009" on faces. Limits are .0005" on diameter and .010" on radius.

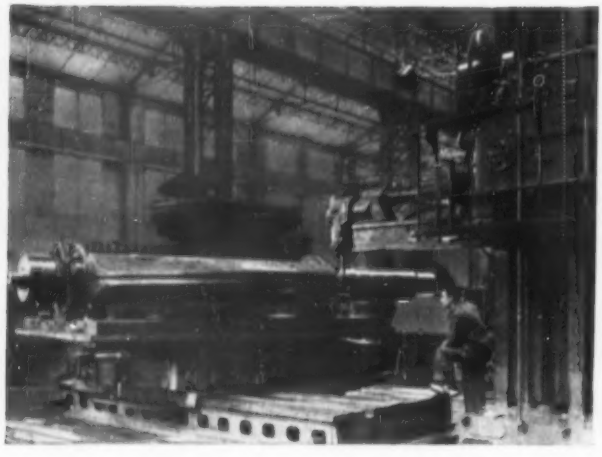
LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

UNSURPASSED ADAPTABILITY

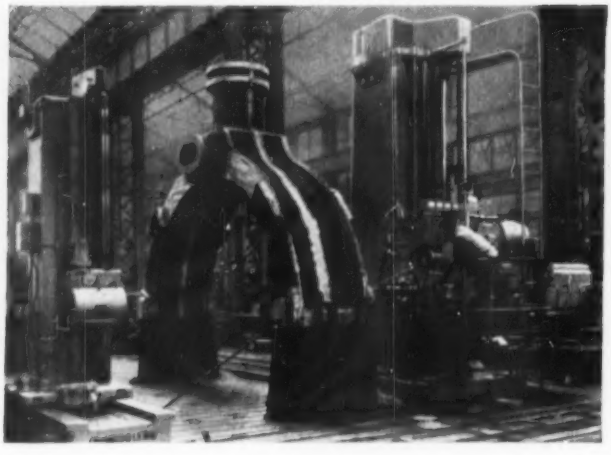
• Profiling rotor spider's rim for 32,000 kw generator, driven by propeller type hydraulic turbine, done on G&L 570-F, Horizontal Boring, Drilling and Milling machine. Rotor weighs 75 metric tons.



Societe Des Forges & Atelier du Creuset (Usines Schneider), France.



• Angular milling attachment, mounted on heavy-duty underarm, permits milling and grooving circular surfaces of steel turbine wicket gate. Rotary table, with ample power for feeds and rapid traverse, assures smooth, accurate milling of workpiece.



• Employing main spindle feed and vertical movement of headstock, operator performs angular and vertical milling of pads on weldment. All operations are controlled from platform or portable control station.

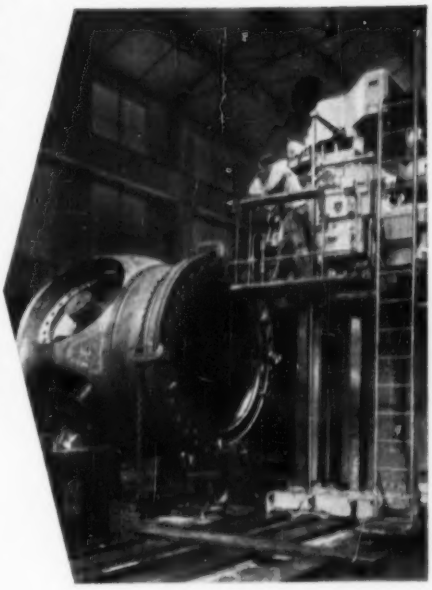
to machine difficult-to-reach surfaces

Societe Des Forges & Atelier du Creusot uses Giddings & Lewis Model 570-F Horizontal Boring, Drilling and Milling Machines with underarm support . . . attachments and accessories. Result — greatly extended scope of operations on huge workpieces.

Hydraulic turbine-generator units, swing jaw and gyratory crusher components and other large castings are only a few of the giants machined to exact tolerances on Giddings & Lewis Model 570-F (floor-type) Horizontal Boring, Drilling and Milling machines. Because these machines are able to perform a wide variety of operations in a single setup, they're always in great demand at Societe Des Forges & Atelier du Creusot (Usines Schneider), France.

The 50 Series machines, illustrated here, are equipped with 7" dia. main and 2.5" dia. auxiliary spindles, each covering a different range of speeds and feeds. Continuous feed facing and boring head permits even greater flexibility of operation involving machining of difficult-to-reach surfaces. Angular milling attachment, mounted on heavy-duty underarm support, allows milling, facing and boring operations at right angles to spindle as far as 60" from the headstock. What's more, use of a power-driven revolving table eliminates numerous extra set-ups of workpiece.

If you'd like to know how to reduce set-up time, speed-up production when machining huge workpieces, contact your Giddings & Lewis representative or write to factory.



• Drilling, boring, reaming, tapping, back facing and countersinking a series of 100mm diameter holes in upper flange of hub for mounting adjustable turbine runner blades accomplished on G&L Model 570-F Horizontal Boring, Drilling and Milling machine.

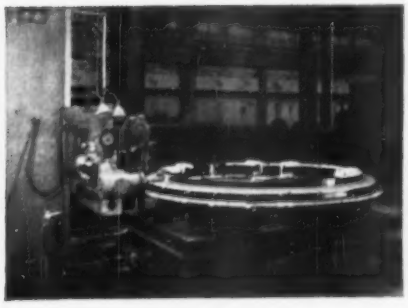
Literature Available:

Ask for Catalog No. 50-F with details on 50 Series Horizontal Boring, Drilling and Milling machines.

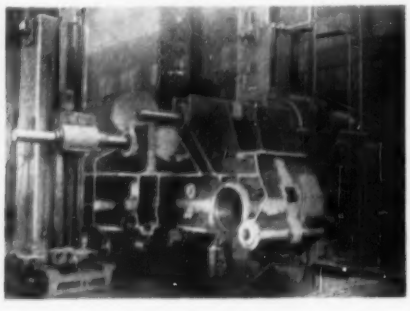
GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

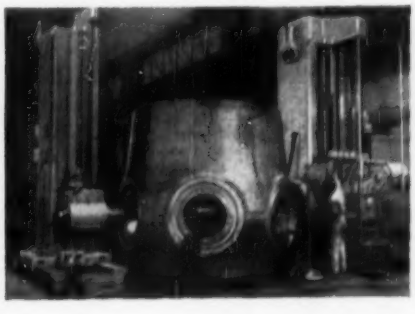
Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Open-side Planers, Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.



• 90° angular milling attachment on underarm permits precise circular milling. Race width, 250mm; cutting depth, 4mm; circular feed, 20mm per min.



• Bearing and shaft bores of 27 (metric) ton jaw crusher frame are precision-machined on G&L Model 570-F machine. Long boring bars, heavy cutting tools are held in perfect alignment with G&L end-support.



• Steel hub (for Kaplan adjustable blade hydraulic turbine-generator unit) is line bored on G&L Model 570-F machine. Boring bar is mounted on continuous feed facing head which handles all boring operations.

VK

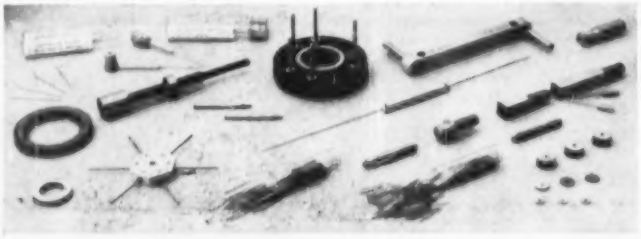
USE OUR SKILLS on YOUR LAPPING PROBLEMS

If that tough production part has Gage Characteristics, try the Van Keuren Precision Lapping Service--

The Van Keuren Co. laps optical flats to an accuracy .000001", gage blocks to .000004", plug gages to .000010". Your job may not be this precise, but it's a safe bet that VK skills can save you money on lapping problems involving size, flatness, parallelism or fine surface finish. If that tough production part has at least one gage characteristic, ask for a quotation from VK.

We lap flat and cylindrical work in both metals and non-metals. Sealing rings and plates for pumps and pressure devices, precision pins, spacers, pistons, punches, carbide pivots, valve parts, instrument components and parts for testing inspection equipment, are among the customer items handled economically here in our plant.

If you require lapped or polished surface finishes in the order of .5 to 5.0 RMS, or dimensional tolerances from .000001" to .0001", The Van Keuren Co. can probably help on the problem. The "rule of thumb", as suggested above, is "at least one gage characteristic."



Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

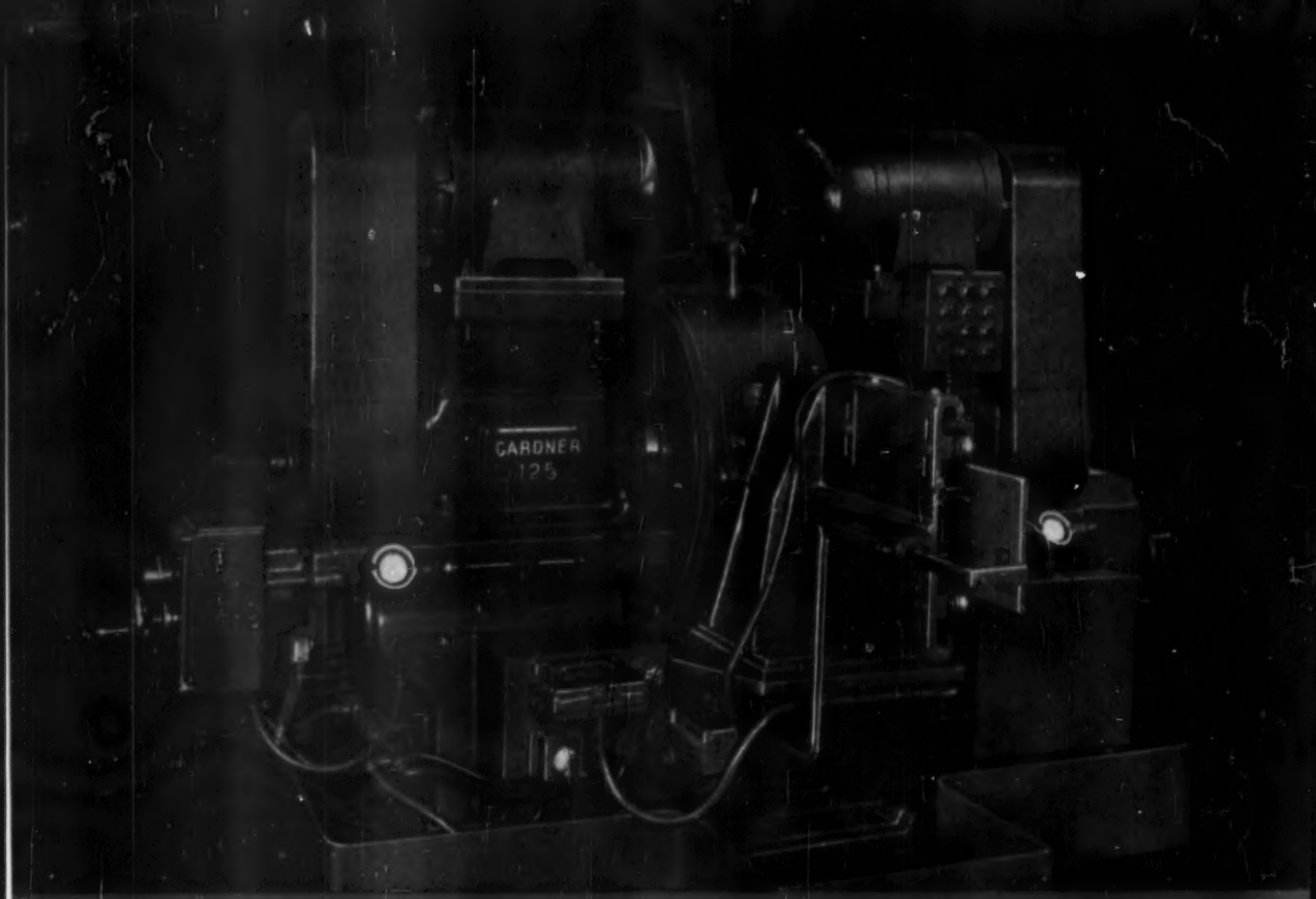
VK

37th YEAR

THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

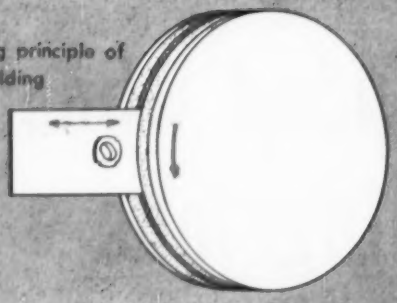
Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Laps and Surface Plates . . . Precision Lapping Service.



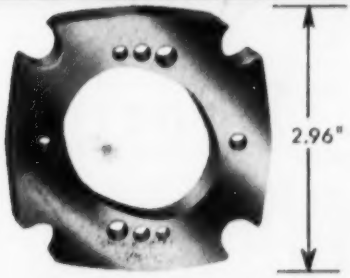
Disc grinds 200 pieces per hour to .0002" for flatness

Parallelism - - - .0002" Uniformity- - - .0003"

Gardner floating principle of work holding



Grinds **TWO** parallel surfaces in **ONE** operation

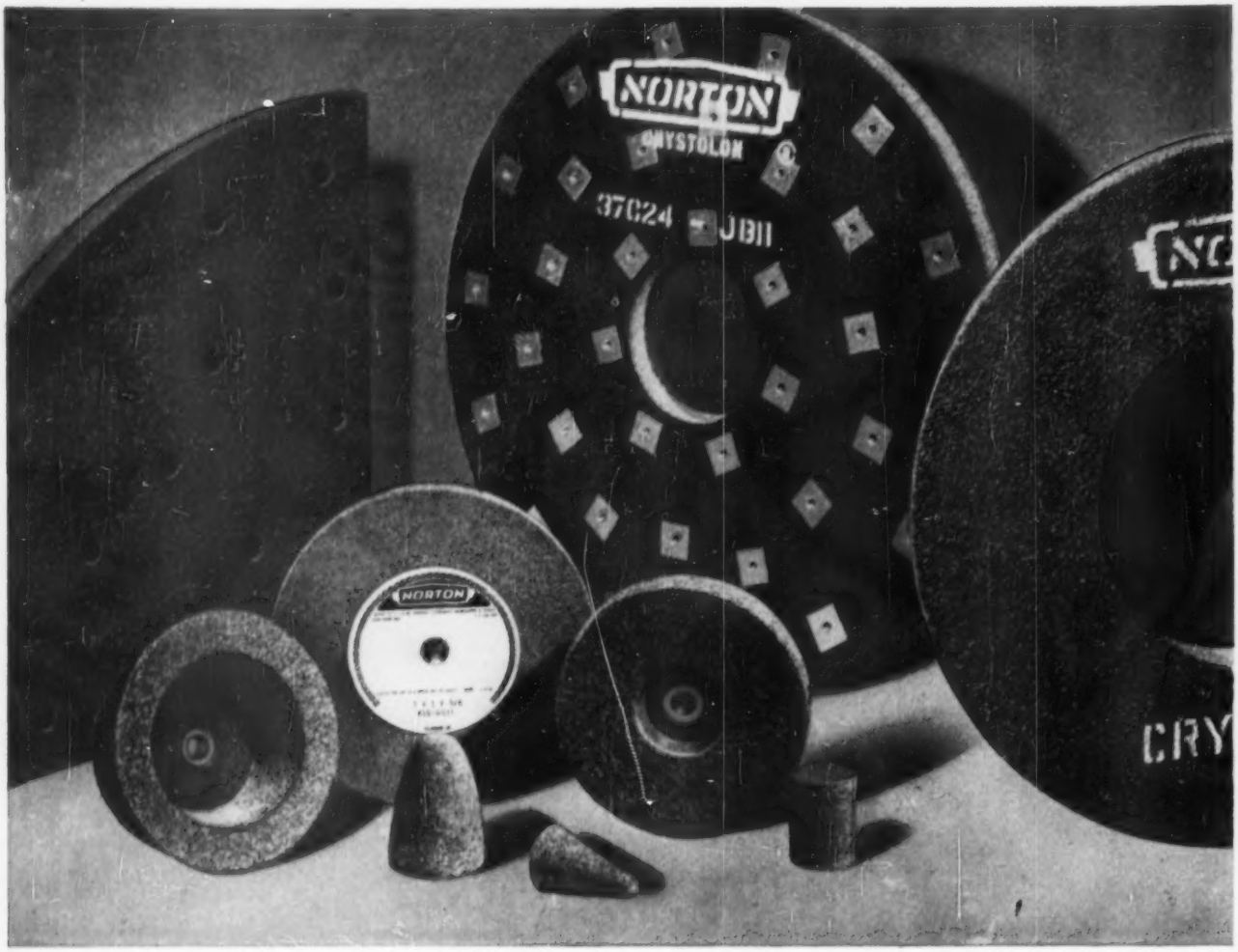


Steel pump ring

GARDNER

precision disc grinders

BELOIT, WISCONSIN



Q. What's new in grinding?

A. B-11 resinoid-bonded wheels —for many grinding jobs

Q. What's new about B-11 wheels?

A. Their great new resinoid bond, improved uniformity and balance, new "TOUCH of GOLD" performance-benefits

Q. What is the B-11 bond?

A. It's the latest Norton resinoid bond. Wheels made with it are excellent for snagging, disc grinding, heavy weld grinding, thread grinding, cam grinding, centerless grinding, roll and surface grinding.

Q. Why?

A. Because B-11 wheels are more uniform in structure, with better balance. As a result, they grind cooler and faster. And on portable machines they "hug that work" closer, with less vibration and bounce.

Q. What about those "Touch of Gold" benefits?

A. They're the direct result of the B-11 wheels' more efficient grinding action. In precision grinding this means improved surface finish, greater accuracy, more pieces per dressing. In rough grinding it means less operator-fatigue and longer wheel life. All these benefits add up to more profitable grinding for you.

Q. Any other advantages of B-11 wheels?

A. Many others. For example you get closest possible duplication. Hardness increments are evenly spaced throughout the entire grade scale. And B-11 wheels can be supplied in half-grade increments, making it even easier for you to choose exactly the right wheel for every job.

Q. Sounds fine — what about more information?

A. Your Norton Distributor will gladly give you the whole story on the new B-11 wheels. Or write us direct. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

W-1676

NORTON

ABRASIVES

Making better products . . . to make your products better

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

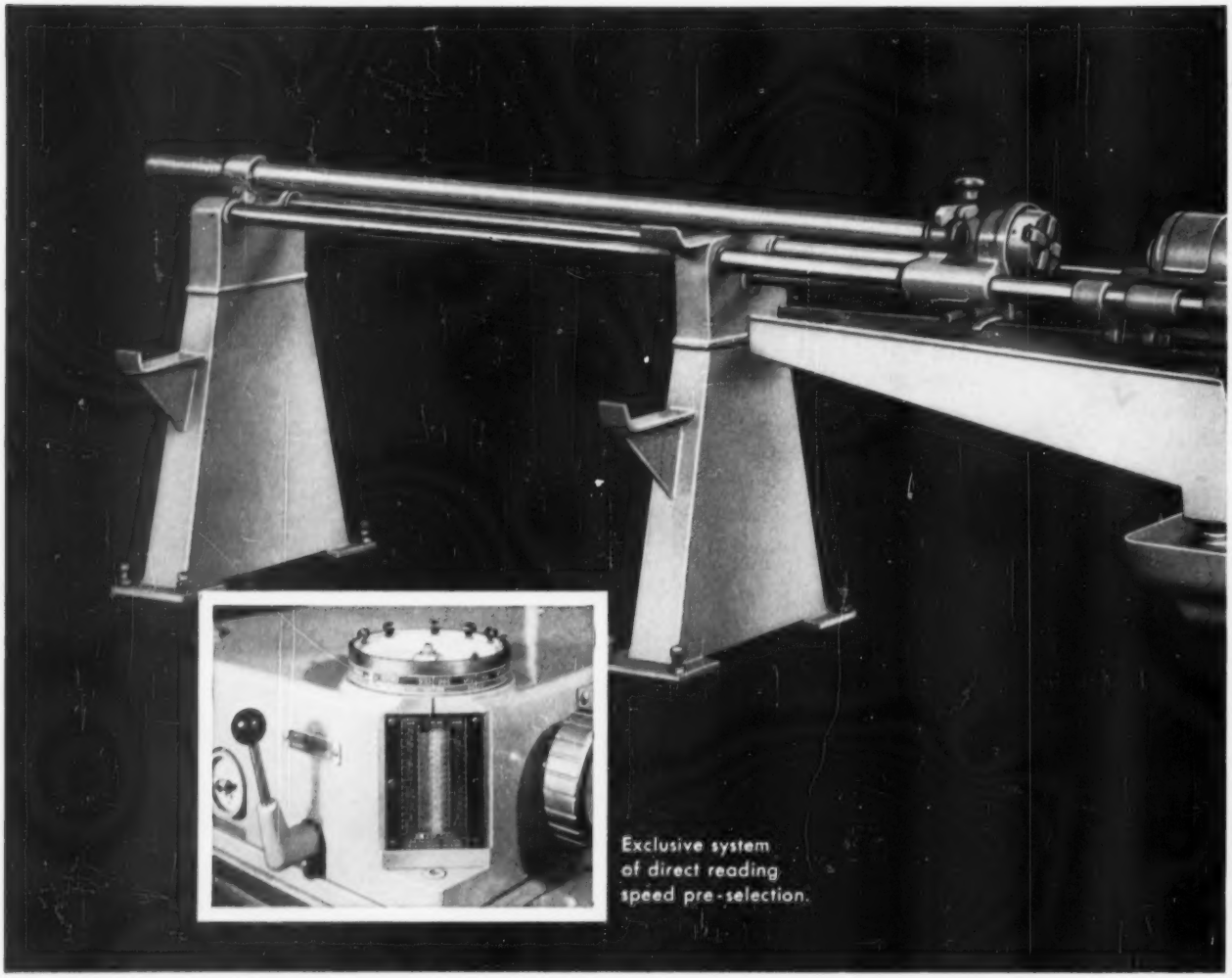
GISHOLT

GISHOLT MASTERLINE NO. 12
AUTOMATIC PRODUCTION LATHE

Sixty-nine years of machine tool experience have gone into this latest design of the Gisholt MASTERLINE No. 12 Automatic Production Lathe. An important contribution to metal-cutting progress, it is ready to produce faster, better and at lower cost—with even less requirements for operator skill and effort. May we tell you the complete facts about it—and how it may be profitably applied to your manufacturing processes?

Gisholt Machine Company, Madison 10, Wisconsin

Look ahead—keep ahead—with Gisholt



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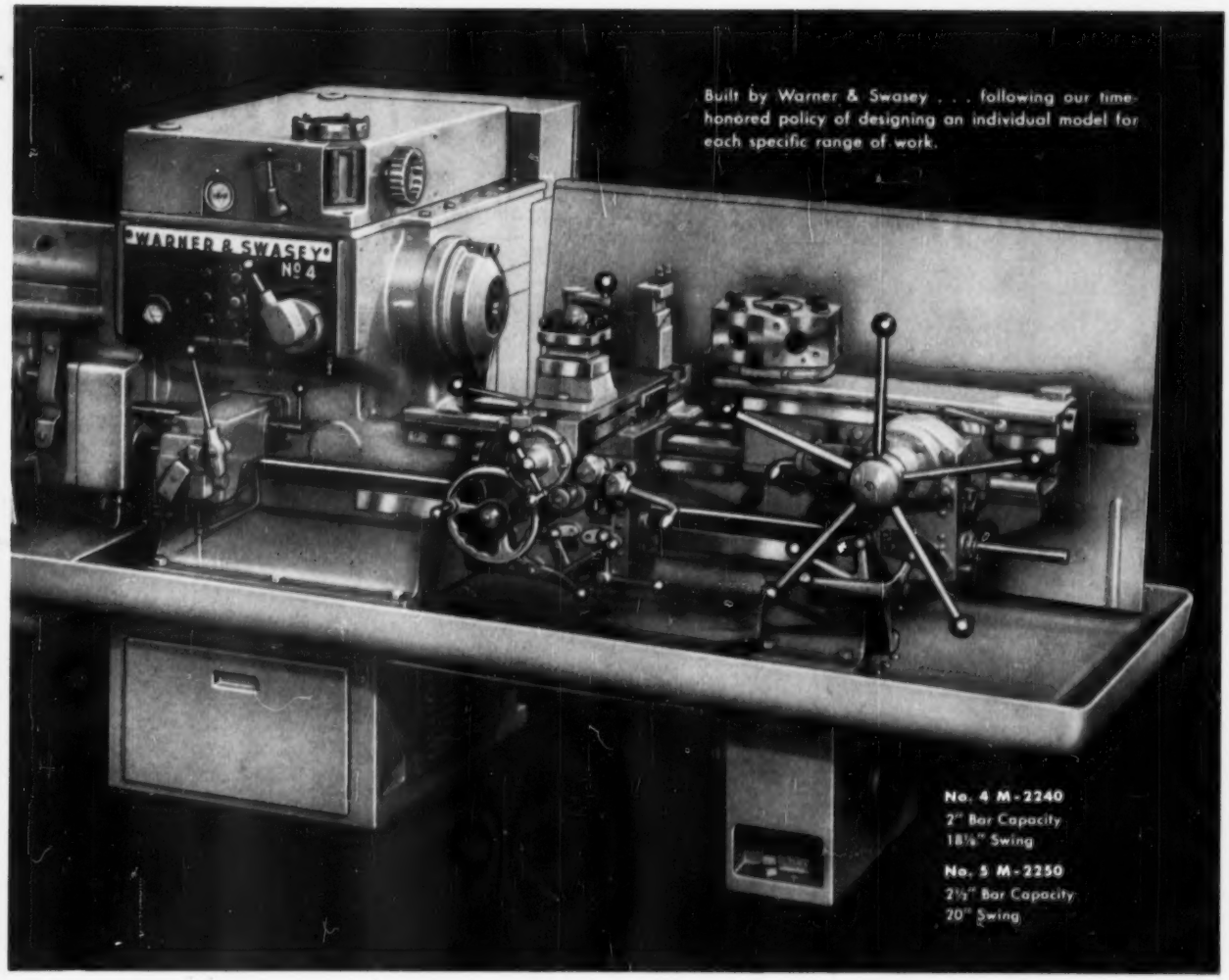
RAM TYPE TURRET LATHES *give you*

- Higher Speeds
- Instantaneous speed changes—sliding gears eliminated
- Direct-acting hydraulic clutches—need no adjustment
- Smooth, quiet running, helical high-speed gears
- Short, stubby shafts—anti-friction bearings throughout
- Single lever control for forward, reverse, brake and free spindle
- One lever control for speed


Built by Warner & Swasey . . . following our time-honored policy of designing an individual model for each specific range of work.
WARNER & SWASEY
No 4
No. 4 M-2240
2" Bar Capacity
18⅛" Swing
No. 5 M-2250
2½" Bar Capacity
20" Swing

SWASEY No. 4 and No. 5

changes and 6:1 ratio high-low shift

- Two-speed motor provides 24 *unduplicated* speeds, forward and reverse, with a 62.5 to 1 over-all range
- Flange-mounted, direct-drive motors—no belts
- Patented direct-reading speed pre-selector—calibrated in rpm's, surface speed and work diameter
- Rigid, heavy-duty, high speed hydraulic bar feed with adjustable feed-out
- Single lever control for hydraulic collet chuck and bar feed
- Zoned operating controls for effortless machine operation
- One-piece head and bed for greatest possible accuracy
- Larger, separate oil sump provides cooler filtered oil
- Retains Warner & Swasey standard tooling interchangeable with your present models

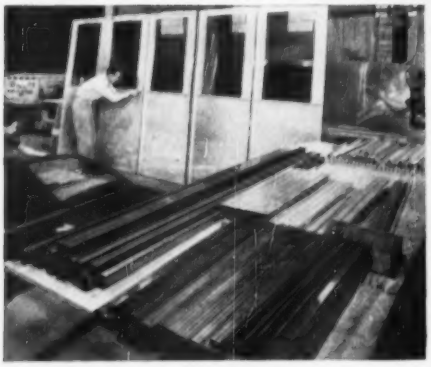
WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS... WITH A WARNER & SWASEY

TEAMWORK of large and small business is responsible for the present prosperity of both. Here, owners Frank, George and Harmon Hugo (left to right) check vital jet engine part with Arnold Armstrong before delivery to General Electric Plant at Evendale, Ohio.

SPECIALLY BUILT OVEN at Portland Copper raises temperatures as high as 2400°—one of many metal treating facilities available at Portland plant.

QUALITY CONTROL has been a major factor in building the firm's reputation. Here, Albert Kozick checks X-ray of special weld for flaws —standard procedure on all jet engine work.



DIVERSITY OF OPERATION—now over 40% non-defense—is typified by new, fabricated aluminum toll booth doors ordered for new Maine Turnpike.

SKILLS LEARNED AS A G-E DEFENSE SUBCONTRACTOR PROVE VALUABLE TO OTHER INDUSTRIES

Portland Copper's success story underlines interdependence of large and small business

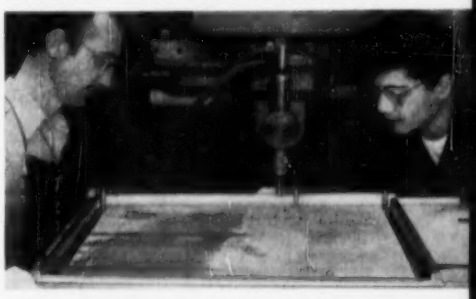
The Portland Copper & Tank Works, Inc., like many small businesses, started with virtually nothing but the personal skills of its owner—in this case a coppersmith who had left Russia in 1909 to seek greater opportunities in the United States. Morris Hugo opened a tiny metal-working plant which existed precariously—with a top gross of only $12,000—until World War II. Then, with ship repair work for the Navy and the U. S. Maritime Commission in 1943, yearly sales abruptly soared to $250,000.

Defense skills developed. After the war the company moved to larger quarters in South Portland, Maine, and built up its reputation as a fabricator of stainless steel, aluminum, and special high-temperature alloys. General Electric entered the picture in 1949 with an order for afterburners for J47 jet engines.

Big business helps small business. The Maine firm quickly proved its ability in precision manufacture, made prompt deliveries. And G.E., well-satisfied with the work, soon became Portland Copper's largest customer. As one of more than 17,000 G-E subcontractors and suppliers in the past 5 years, the Portland firm has *continued* to expand in other non-defense areas: pulp, paper, textiles, chemical and petroleum industries. It now grosses better than $5,000,000 annually, reports an employee roster of 423—as compared with 100 in 1949.

Contributes to nation's production. This success story dramatizes once more the interdependence of large and small business—and how such a system operates for the benefit of both. General Electric has gained essential services and jet engine components needed to help build up the nation's defense. Portland has acquired new skills and facilities which now make the firm valuable to other manufacturers in our expanding national economy. 649-5

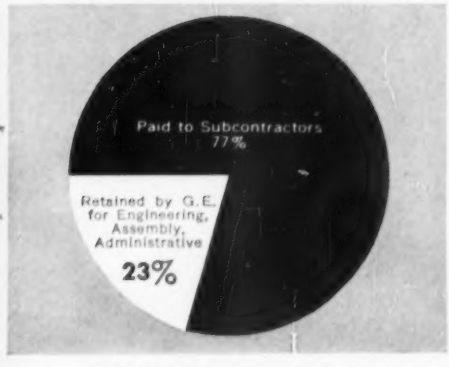
INTRICATE FABRICATION is one of more difficult operations Portland performs successfully. Here R. L. Clark checks stainless steel section of a powerful G-E gas turbine.



NEW SKILLS learned as a G-E defense subcontractor are now applied to a variety of jobs for other manufacturers. Typical is this precision welding by Portland Copper and Tank personnel on aluminum panel assembly.

Progress Is Our Most Important Product

GENERAL ELECTRIC



SUBCONTRACTORS who helped G.E. build the J47-GE-25 during the Korean War got 77 cents of every dollar government paid General Electric for engine.

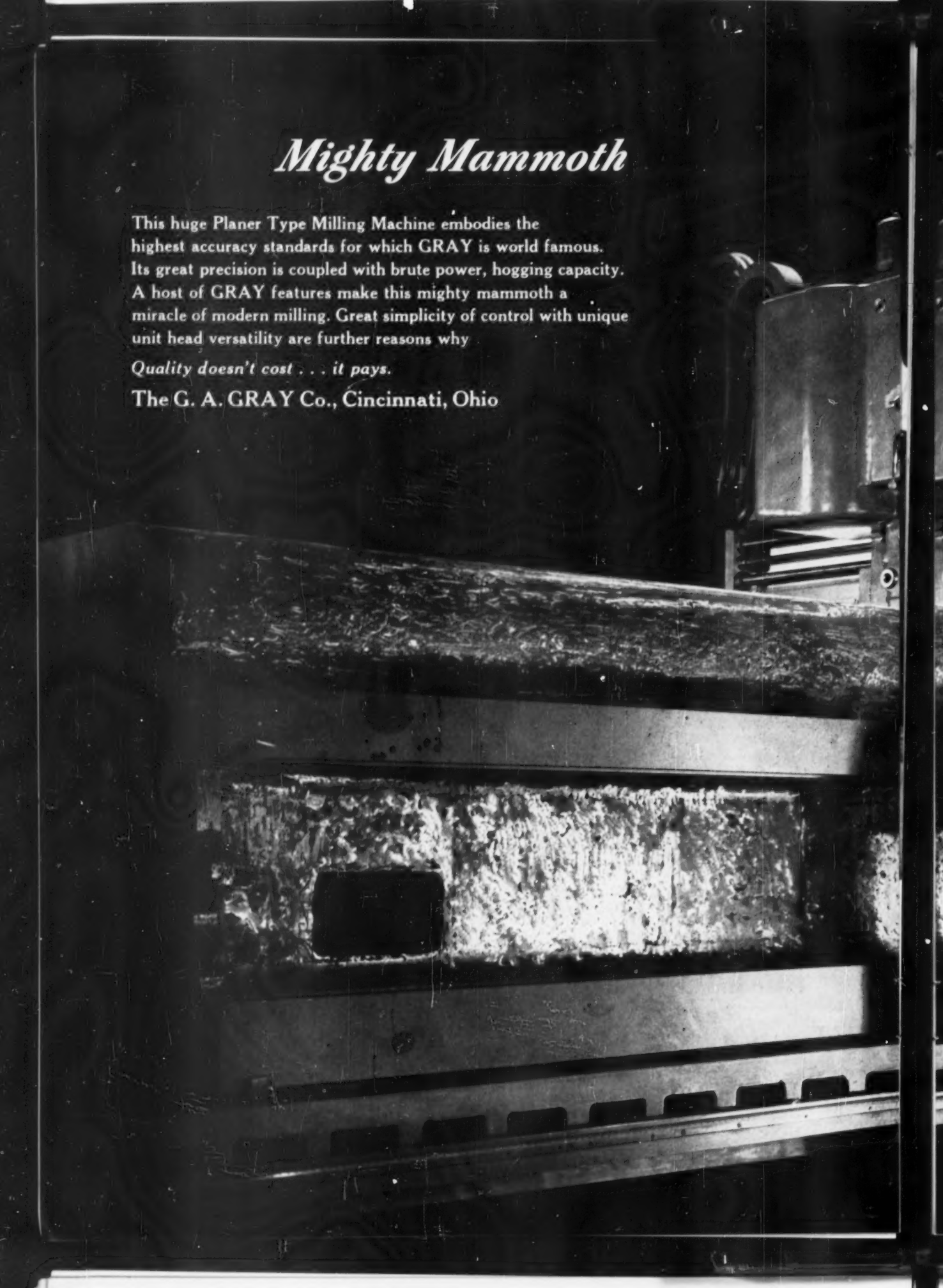
Can Small Business Help You?

Thousands of small businesses, like Portland Copper and Tank, have furnished General Electric with practically every kind of skill and service as defense subcontractors and suppliers.

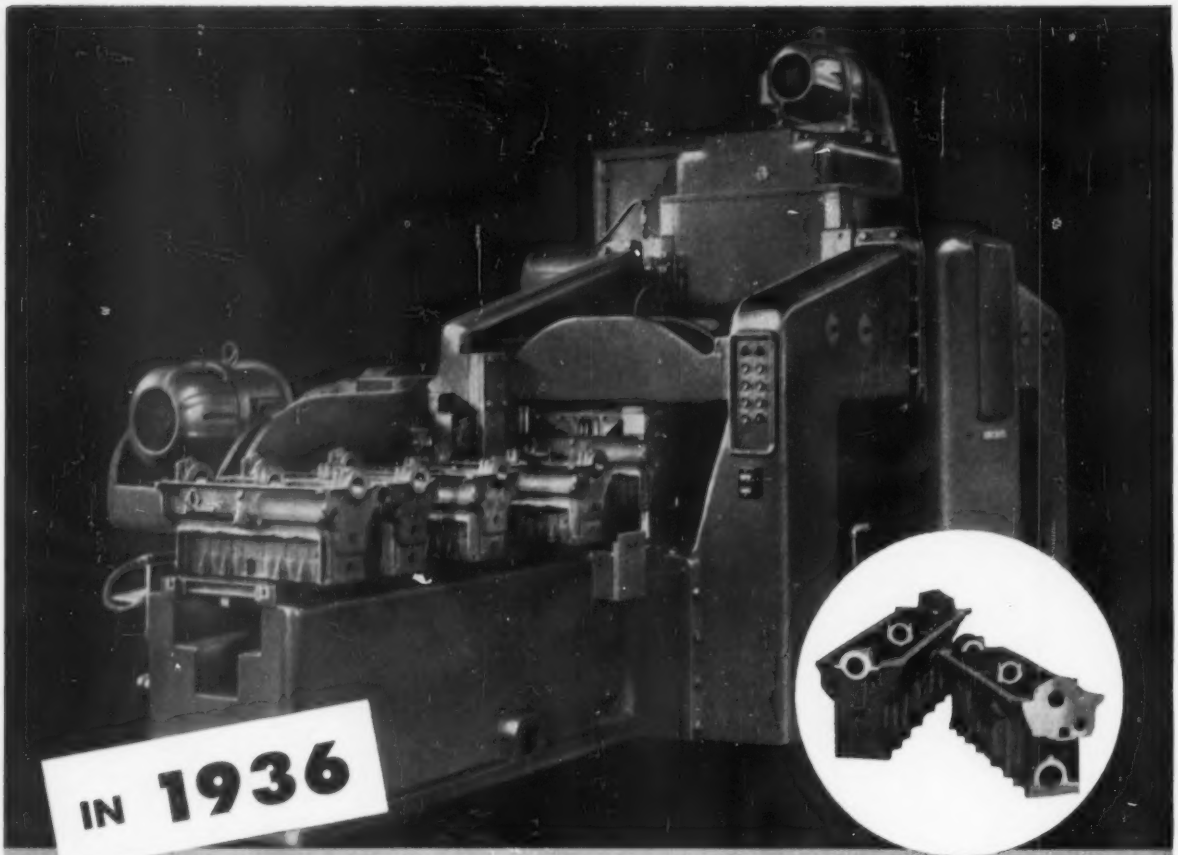
Many of these companies have available production capacity, created in large part by the reduction of defense orders since the Korean War peak. This means that they may be able to apply their skills to help you with your production.

If you have a manufacturing problem or have work available for subcontracting, please write us on your letterhead stating in as much detail as possible the type of services or skills you require. We will be glad to suggest several small businesses who have done similar work for us and may be able to help you.

Write to C. W. Bryant, Manufacturing Services Division, General Electric Co., 570 Lexington Ave., New York 22, N. Y.


Mighty Mammoth
This huge Planer Type Milling Machine embodies the highest accuracy standards for which GRAY is world famous. Its great precision is coupled with brute power, hogging capacity. A host of GRAY features make this mighty mammoth a miracle of modern milling. Great simplicity of control with unique unit head versatility are further reasons why
Quality doesn't cost . . . it pays.
The G. A. GRAY Co., Cincinnati, Ohio

GRAY



SUNDSTRAND DELIVERED THIS TRANSFER TYPE MACHINE AND IN A 7 YEAR PERIOD IT:

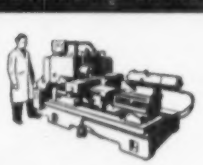
- **Automatically milled 16 surfaces each machine cycle**
- **Saved $249,984.00 per year in addition to increasing tool life**
- **Produced 8,750,000 cylinder blocks in 7 years**
- **Replaced 18 special milling machines**
- **Eliminated "Operator's fatigue"**

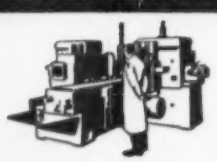
SUNDSTRAND

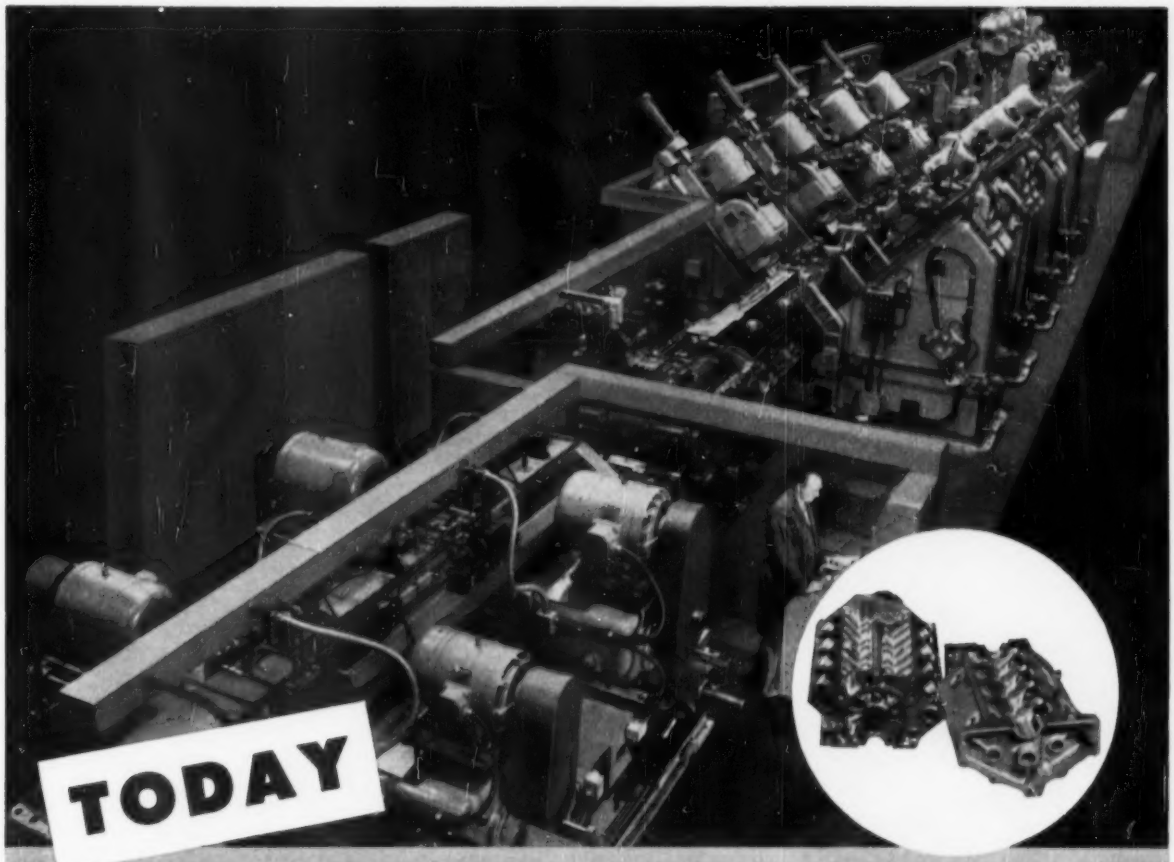
*"Engineered Production" Service**

*REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS







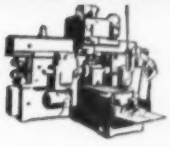
THIS SUNDSTRAND TRANSFER TYPE MACHINE:

is performing similar operations automatically with comparable present-day savings.

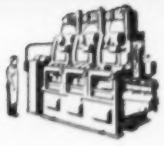
SUNDSTRAND *has pioneered in other progressive machine tool designs . . . .*

For Instance, most recent is the punch card controlled automatic lathe for turning shafts automatically. In the field of machine tools there are also progressive milling and turning machines and designs for accessory equipment. Get all of the facts. Write for a complete set of bulletins today. Ask for Set No. 163.

TRIPLEX RIGIDMILS



SPECIAL MACHINES



SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

Added Evidence that —

Everyone Can Count on VEEDER-ROOT

This Veeder-Root Reset Magnetic Counter (AC or DC) is actuated through electromagnets. And it may be connected in series with any device having a contact arrangement . . . like the specially designed Veeder-Root Electrical Contactor at the left, which insures positive operation of the counter, either in oscillation or connected directly to a revolving shaft . . . with the counter placed at *any* distance from the machine or process on which the count is required.

This is another one of the hundreds of Veeder-Root Standard and Special Counting and Computing Devices developed for every conceivable counting duty, in every field from atomics to electronics.

What do *you* need to count? Just write:

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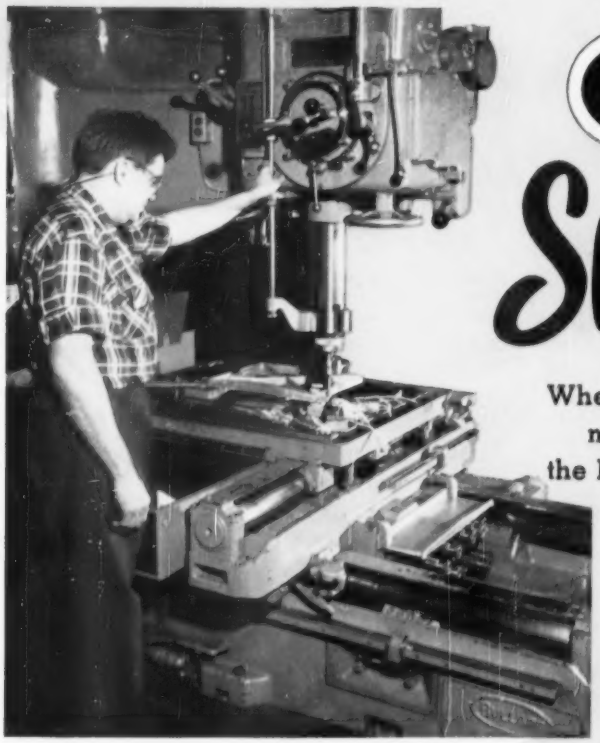
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities
"The Name that Counts"

ACCURATE LOCATING PERFORMANCE

Acclaimed By Customer with . . .



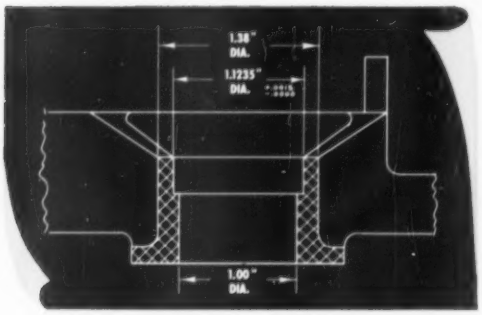
BULLARD Spacer Table

Where close tolerances must be maintained on repetitive pieces the Bullard Spacer Table is a "natural"

"The machine is simple to operate. We have found the Bullard Spacer Table very useful in our work", says a foreman at San Diego Division of Convair, "It eliminates the necessity of zeroing to a set position. And there is no chance for error, which is important when you make accurate parts for airplanes."

This same accuracy to close tolerances can be applied to your drilling, reaming or tapping operations without the high cost of jigs or fixtures.

Identical machining operations on each of three holes for battery carriage are performed on the Bullard Spacer Table.



OPERATION DATA

OPERATION	SET-UP TIME	UNIT TIME
Drill 1" dia.	.70	.2066
Counterbore 1.1235" dia. at 1.000 dia. .350" deep	.25	.0566
Face 1.38" dia.	.25	.0356

CALL YOUR NEAREST BULLARD REPRESENTATIVE OR WRITE FOR SPACER TABLE CATALOG TO

THE **BULLARD** COMPANY

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This Veeder-Root Reset Magnetic Counter (AC or DC) is actuated through electromagnets. And it may be connected in series with any device having a contact arrangement . . . like the specially designed Veeder-Root Electrical Contactor at the left, which insures positive operation of the counter, either in oscillation or connected directly to a revolving shaft . . . with the counter placed at *any* distance from the machine or process on which the count is required.

This is another one of the hundreds of Veeder-Root Standard and Special Counting and Computing Devices developed for every conceivable counting duty, in every field from atomics to electronics.

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"The Name that Counts"

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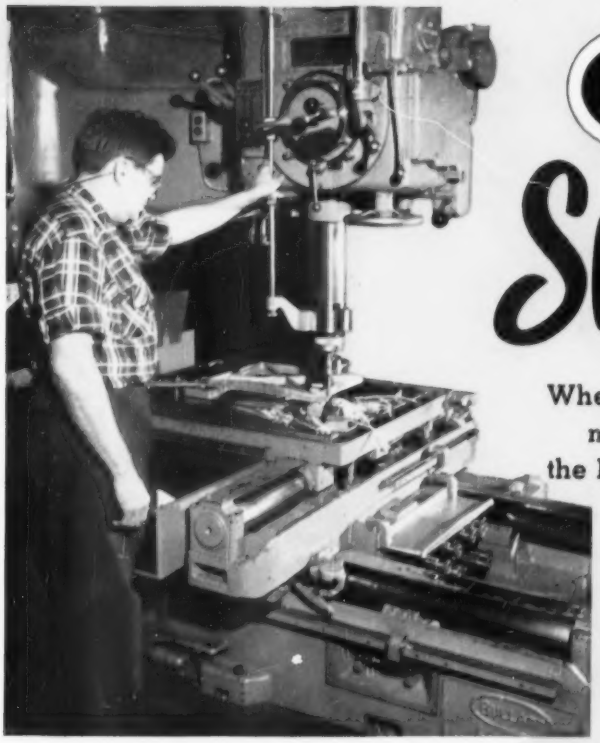

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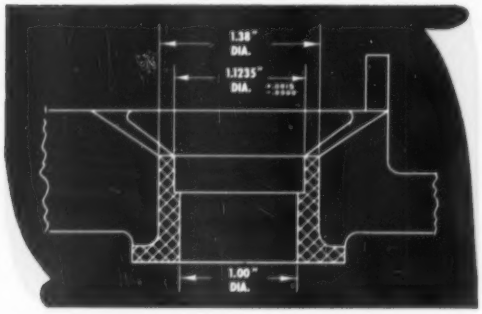

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CALL YOUR NEAREST BULLARD REPRESENTATIVE OR WRITE FOR SPACER TABLE CATALOG TO

THE **BULLARD** COMPANY

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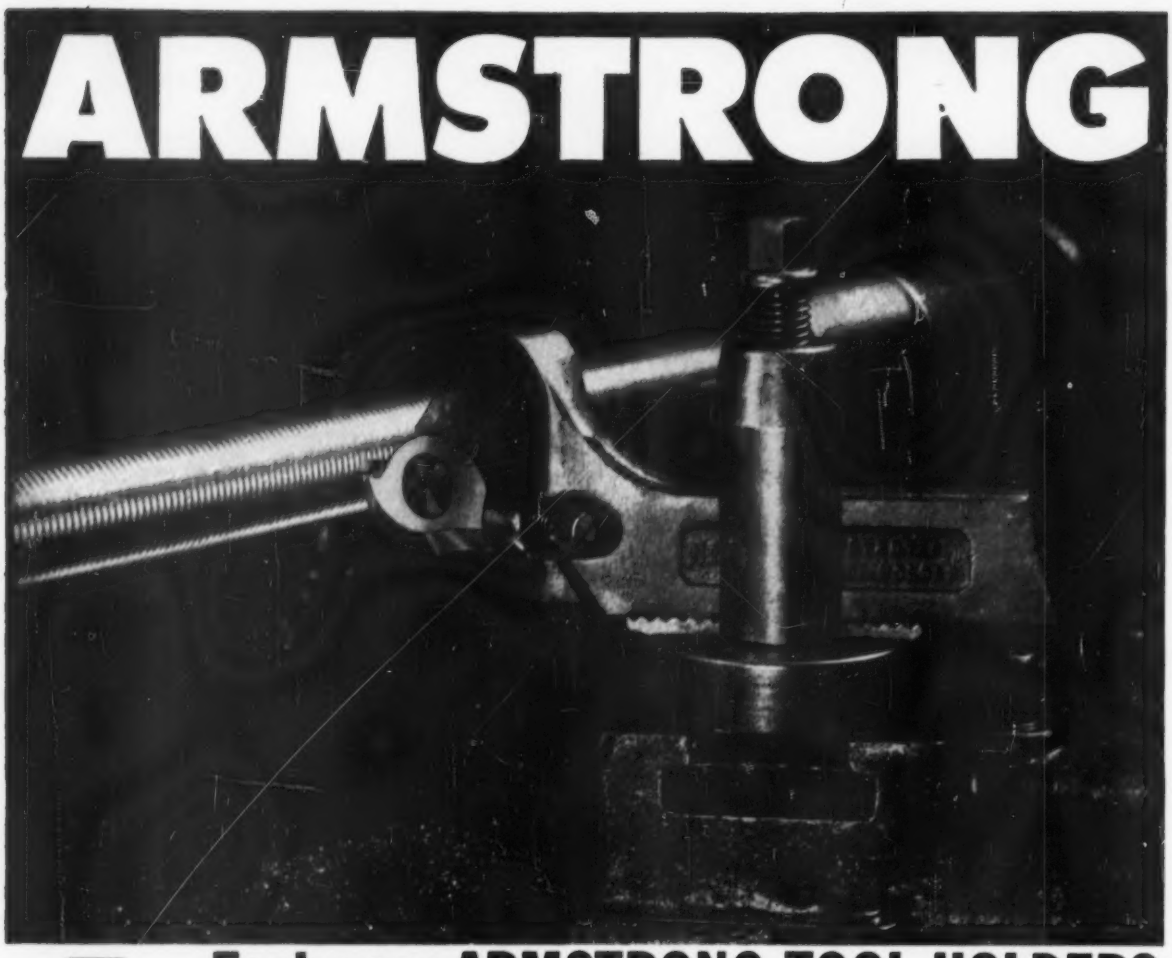
ARMSTRONG



The ARMSTRONG Threading Tool takes interchangeable high speed steel form-cutters which require only flat top grinding to resharpen—always hold their true thread form.

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More than ever before, your LODGE-ical choice is... **Lodge & Shiple**

Use WELDED STEEL for Greater Strength with Less Weight!

Illustrated above is one of two Walking Shoes for a large wheel excavator employed in strip mining operations . . . it is one of many heavy parts and assemblies of parts fabricated and machined by Mahon for manufacturers of several types of mammoth earth moving machines. If you can use weldments to advantage in your product, you can turn to Mahon for complete service including design or redesign, fabrication, machining and assembling. Steel-Weld Fabricated parts and products shown at left are typical of thousands produced by Mahon for manufacturers of processing machinery, machine tools, and other types of heavy mechanical equipment. If you need weldments, or welded steel in any form, you will find a unique source in the Mahon organization . . . a source where design skill and advanced fabricating techniques are supplemented by craftsmanship which assures a smoother, finer appearing product embodying every advantage of Steel-Weld Fabrication. See Sweet's Product Design File for information, or write for Booklet showing Mahon's facilities to serve you.

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Engineers and Fabricators of Steel in Any Form for Any Purpose

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Living up to a standard for comparison isn't easy. That's why Crucible lavishes special care on the manufacture of REX® high speed steels... to keep REX the *standard* wherever high speed steels are used—as it has been for over half a century.

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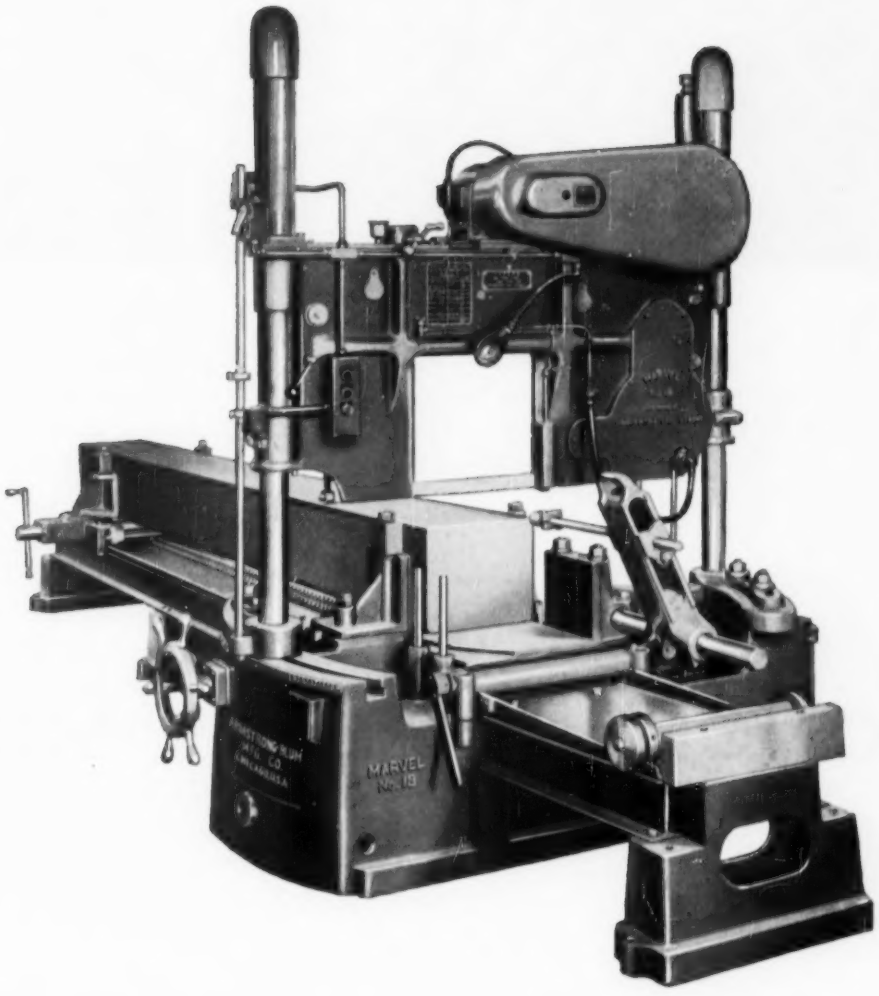

No Job too big or too tough . . .

for MARVEL "*Giant*" Hack Saws

These giant MARVEL Hydraulic Hack Saws (No. 18, Capacity 18" x 18"; and No. 24, Capacity 24" x 24") were *basically* designed for rapid and economical cut-off of BIG WORK. They are not merely "conventional" designs "stretched" to big capacity. They are truly designed and built with the ruggedness and rigidity necessary to withstand the rough treatment of sawing big work, even though the work is in the "toughest of the tough" alloys.

They are reliably fulfilling the cut-off requirements in innumerable steel mills, forge shops, structural shops, warehouses, and machine shops, with assured low tool cost and minimum kerf loss of steel.

In addition to cutting-off, they are reducing costs by eliminating further machining operations. Heat treated die blocks are being reclaimed for re-sinking by sawing off the worn face; columns, beams, pipe, and tubing are being sawed to *finished*, square ends, eliminating milling; angular sawing is done conveniently by swinging the upper structure on the base, to any angle up to 45 degrees—*without moving the work*.

Contemplating the modern trend toward ever tougher steels and larger sizes, these are the logical sawing machines to buy, not only for today's needs but for tomorrow's as well.

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Metal Cutting MARVEL SAWS
Better Machines—Better Blades

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ONCE IN A BLUE MOON

Jones & Lamson is in the habit of coming up with excellent turret lathe developments, but only "once in a blue moon" do we offer so *many* at once.

All-out efforts in research and development have been turned towards designing machines that will reduce costs, increase production and keep both operators and management happy.

Here are some of the results:

We've developed simple "on-the-machine handling" with effortless and integrated control through Hydra-Clutch Headstocks and Geneva Saddles.

We've combined necessary horsepower with field-proven experience on how to use it.

We've combined two-way tracing with normal turret lathe operation.

We've increased versatility and operation ease by means of tape-controlled turret lathes with pre-set tooling. Set-up is so quick it makes even "one piece" production as feasible as long run jobs.

We've perfected automatic thread chasing on standard turret lathes — thereby reducing idle time and increasing accuracy and production.

These and other engineering achievements are bound to help your plant operation. Write Dept. 710 today for literature and technical data.

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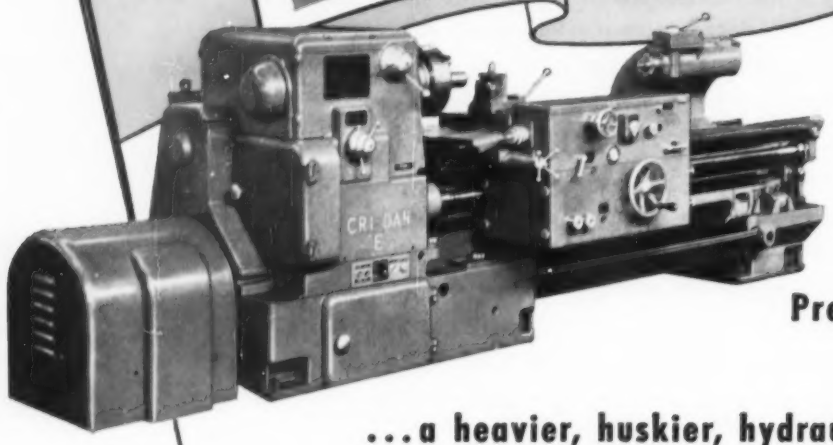
Turret Lathes • Fay Automatic Lathes • Milling & Centering Machines • Thread & Form Grinders • Optical Comparators • Threading Dies & Chasers

CRI-DAN E

FOR EXCELLENCE in all Threading Operations



Presenting the "E"

...a heavier, huskier, hydraulically controlled

CRI-DAN

It's Here—At Your Request. Yes, the tremendous acceptance of Cri-Dan "B" and Cri-Dan "D" has resulted in the development of a larger, heavier precision threading machine greatly extending the range of the Cri-Dan Single Point Threading Method. Not only precision threading but secondary turning, boring, facing and chamfering facilities are incorporated in the Cri-Dan E; complete hydraulic and electric controls assure maximum efficiency even on the heaviest applications. A quick check of the specifications will show the ruggedness and range of this, the newest and finest Cri-Dan Single Point High Speed Threading Machine ever developed. Write The Lees-Bradner Company, Cri-Dan Division for specific information on the processing of your parts.

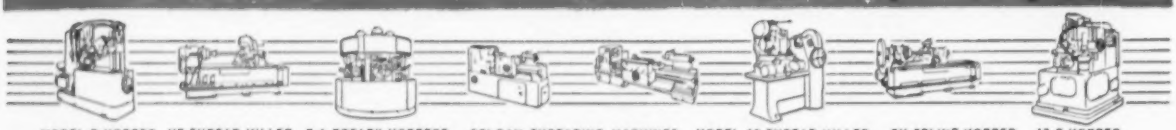
SPECIFICATIONS

Threading Range	2 TPI-48 TPI	Max. Taper of Thds.	15° Included
Max. Thd. Dia. (Internal)	16" Dia.	Multi-Start Threads	Yes
Max. Thd. Dia. (External)	12" Dia.	Spindle Speeds	50-1400 RPM
Max. Swing Over Ways	25" Dia.	Main Motor	20 H.P.
Max. Swing Over Tool Slide	12" Dia.	Floor Space Req'd	5'6" x 14'0"
Max. Thread Length	6½"	Approx. Weight	4½ Tons
Length Between Centers	2'6", 5'6" & 8'6"		

CRI-DAN DIVISION

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



MODEL R HOBBER · MT THREAD MILLER · 7-A ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-S HOBBER

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S-200 REVIEW OF AIR GAGING

In "A Review of Pneumatic Dimensional Gages", Louis Polk, chairman and president of The Sheffield Corporation, describes the different types of air gages, their applications and uses. Amply illustrated with schematic drawings of pneumatic circuitry and photographs of multiple-dimension and automatic air gages. Contains selective bibliography on air gaging. 24 pages.

S-201 THEORY OF GAGING

Reprint from an address before the American Society of Mechanical Engineers, this six page technical paper reviews the operating principles of several types of mechanical, electrical, electronic and pneumatic gages. Many schematic drawings.

S-202 66 CENTURIES OF MEASUREMENT

Commemorative booklet issued at the time the permanent exhibit of precision measuring instruments was established at the Smithsonian Institution, Washington, D. C. Includes 16 colored drawings depicting significant periods and advancements in the history of measurement since 4700 B.C.

S-203 VISION IN METROLOGY

Printed from an address by Louis Polk, this pocket size booklet tells the story of measurement from the Cubit of the ancients to the "Barc" of the atomic age. In conclusion, the author presents some stimulating thoughts about the methods for dimensional control in the future.

S-204 ELI WHITNEY METROLOGY LABORATORY

This pocket-size booklet describes the construction, inspection environment, and instrumentation in Sheffield's newly opened laboratory for precision measurement. Lists the types of Measurement and Inspection services available to Industry including Gage Block and End Measure Calibration, Hardness Testing, and Surface Finish Analysis.

S-205 CATALOG

Twelve page, easy-to-read catalog containing application and engineering data on standard Sheffield control units for automatic machine control, gaging, classifying, and segregating processes. Many photographs and diagrams of typical automated production processes.

S-206 THE SHEFFIELDER

A 4-page newspaper written for shop, production, and inspection personnel. Mailed free-of-charge 4 to 6 times a year. Contains feature articles and photographs on new gages and inspection instruments, better inspection practices, and news from Sheffield's Machine Tool Division.

S-207 GENERAL CATALOG

New 16-page, fully illustrated General Catalog of Sheffield Precision Products and Services. Included are Thread and Form Grinders, Annular Form Grinders, Crushtrue Grinding Machines, Threading Machines, Taps, Chasers, and Ultrasonic Machine Tools; also, Precisionaire Inspection gages, Automatic and Multiple dimension gages, Toolroom and Inspection Instruments, and Contract Services.

S-208 NON-CONTACT X-RAY GAGE

A 16-page catalog describing the Sheffield "Measuray"—a non-contact X-Ray gage for continuous or intermittent measurement of strip or sheet stock while in motion or stationary—hot or cold. Contains models and capacity ranges as well as types of materials on which it can be used.

S-209 PRECISIONAIRE INSTRUMENTS

This 30-page catalog and price list on Precisionaire column-type air gages contains the full line of base instruments, with their amplifications and scales, and complete lists of standard sizes and types of air spindles, air snaps, Plunjet gaging cartridges, and types and sizes of adjustable air tooling.

S-210 PLUNJET GAGING CARTRIDGES

A 24-page catalog showing types, sizes, amplifications, tolerance and ranges of Sheffield Plunjet gaging cartridges. Contains engineering and technical data on the use of Plunjets to single and multiple dimension inspections and for machine control applications.

S-211 AIR GAGING JET ENGINE BLADES AND BUCKETS

The critical dimensions and conditions of jet engine blades or buckets and how they are gaged quickly and accurately with Sheffield Precisionaire gages are described in this 28-page catalog.

S-212 ADJUSTABLE AIR GAGE TOOLING

Engineering Data Sheets describing types and sizes of adjustable air gage tooling for use with Precisionaire instruments and other makes of air gages. Gages for measuring inside diameters include four adjustable spindles with ranges from ⅛" to 9/16", 9/16" to 1", ¾" to 1 ½" and 1 ½" to 3". Also, the adjustable Airebore Gage Kit for any size bore from ¾" to 12", and the 1" to 3" adjustable Balljet spindle kit. Standard 1" adjustable Plunjet Snap gages are available covering the range from 0" to 12".

S-213 AIRETEST INDICATOR

An 8-page Engineering Data Sheet covering the use of the Sheffield Airetest Indicator with the column type Precisionaire. It describes how this new style pneumatic pickup unit is used to accurately determine height, flatness, parallelism, and concentricity.

S-214 PLUNJET STEEL AND STONE FLATNESS GAGES

This Engineering Data Sheet shows how a Plunjet gaging cartridge applied to either a steel or stone surfaceplate makes an ideal combination for checking flatness to a high degree of accuracy.

S-215 PLUNJET EXTERNAL GRINDING GAGES

Engineering Data Sheet showing how a Plunjet gaging cartridge is used with Foster and Arnold Visual Grinding Gages to indicate stock removal evenly without oscillation or flicker normally associated with a dial indicator reading.

S-216 CRUSHTRUE WHEEL DRESSING PROCESS

What Crushtruing is and how it can be used is told in this 12-page catalog. Contains types and sizes of Crushtrue devices available for both surface and cylindrical grinders, and information on their selection. Many case histories and illustrations.

S-217 PRECISION THREAD AND FORM GRINDERS

Machine information and specifications catalog on Models 101, 103, 105, and 107 Precision Thread and Form Grinders. All models capable of plunge grinding.

S-218 MODEL 109 PRECISION ANNULAR FORM GRINDER

Use and specification information on this grinder which has a capacity of 12" between centers and will grind a maximum diameter of 4" with a 14" wheel, and will accommodate work up to 7" in diameter.

S-219 MODEL 180 CRUSHTRUE MULTI-FORM GRINDER

An 8-page catalog covering machine features and specifications of new model 180 Grinder. This machine uses a 4" wide Crushtrue dressed wheel and will grind work up to 10" in diameter and will accommodate a workpart 24" long. Features automatic grinding and gaging, automatic Crushtruing and automatic compensation for wheel wear after dressing.

S-220 MODEL 134 PRECISION THREAD AND FORM GRINDER

Both single and multi-pass models are described in this 8-page catalog. Model 134 is used to grind threads up to ½" diameter x 4" long within a pitch range from 20 to 120 T.P.I. Machine features include automatic grinding cycle, automatic wheel dressing, and automatic compensation.

S-221 MICRO-FORM GRINDERS

An 8-page catalog with inserts covering Sheffield's Micro-Form Grinders. These machines grind circular and flat form tools, templates, profile gages, cams, and Crushtrue rolls, etc., directly from a drawing of 50:1 ratio. Neither templates nor masters are required. Work is checked without removing from machine.

S-222 MODEL 140 GEAR GRINDER

An 8-page catalog containing machine and specification information on this reciprocating type gear grinding machine that is used to produce precision ground helical and spur gears from 8 to 50 inch. Crushtruing is used to form the grinding wheel to the basic rack form. Maximum work diameter is 8" and grinding stroke 4".

S-223 GEAR DEBURRING MACHINES

Machine features and specifications of seven models of gear deburring machines are described in this 8-page catalog. Both single and two station models are included.

S-224 GEAR AND SPLINE DEBURRING MACHINES

Six standard models and their specifications are included in this 8-page catalog. These machines are used for precision chamfering, tooth rounding or pointing of gears and splines. Gears up to 13" in diameter can be handled on standard machines—larger on special.

S-225 MACHINING THE UNMACHINABLE

A 16-page booklet describing the techniques, advantages, uses and machines for ultrasonic machining of hard materials such as carbides, glass, and ceramics.

S-226 AUTOMATIC WELDING MACHINES

A 4-page Engineering Data Sheet describing both Point and Disk type welding machines that are used for automatic welding of point and disk shape contacts of precious and semi-precious metals to small contact arms, leaf springs, and instrument components. Examples of metals that can be welded are gold, silver, platinum, palladium, and iridium.

S-227 THREADING TOOLS — TAPS AND DIE HEADS

A 16-page catalog showing a large variety of types and sizes of the threading tools available from the Murchey Division of Sheffield. Included are collapsible taps and self-opening die heads, solid taps, chasers, and chaser accessories for setting and grinding.

S-228 PRECISION THREADING UNIT — PRECISION-PAK

The Sheffield PRECISION-PACK, a self-contained precision threading unit that can be used also for boring, chamfering, and reaming is described in this 4-page folder. Threading capacity: Internal—1 ½" to 4"; External ⅝" to 4"; Maximum pitch 8.

S-229 THREAD ROLLING ATTACHMENT — PRECISION-ROL

A 4-page folder covering five standard models of PRECISION-ROL thread rolling attachments for automatic screw machines and turret lathes. Many case histories with threading production times included.

S-230 VISUAL GAGES

A 20-page catalog on the "Shop Proof" Visual Gage—an indicating comparator which is set by precision gage blocks or master gages. Includes types, sizes, amplifications, accessories, and their use in receiving, production, and final inspection.

S-231 ELECTRONIC GAGE BLOCK COMPARATOR

Engineering Data Sheet covering the Sheffield Electronic Gage Block Comparator that is used to calibrate gage blocks to reference masters to a certified accuracy of several millionths of an inch. Available with dual amplifications of 50,000/200,000, 10,000/100,000 or 10,000/20,000 to 1.

S-232 ELECTRONIC HEIGHT INDICATOR

Engineering Data Sheet on this Height Indicator that has a vertical range 0" to 26" and standard amplification of dual 1,000/2,000 to 1.

S-233 ELECTRONIC LEAD MEASURING INSTRUMENT

A 4-page Engineering Data Sheet describing an Electronic Leadchek which will handle work up to 36" between centers and a maximum diameter of 10". Standard remote Electronic Amplification, 2,000 to 1.

S-234 ELECTRONIC INTERNAL MEASURING INSTRUMENT

A 3-page Engineering Data Sheet covering Type N-6 Internalchek used to inspect master and ring gages and other high precision work for size, taper, bellmouth, and out-of-roundness. Standard inspection range .370" to 12", with a vertical range up to 1½". On special order, diameters down to .240" can be inspected.

S-235 DIMENSIONAL CONTROL AND GAGING POLICY

A 40-page booklet containing important information for inspection personnel on gages and gaging policy, gagemakers' tolerances, unilateral and bilateral gage tolerances, and the care, control and use of gages. Also included are diagrams and charts on Unified and American Standard Screw Threads.

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U. S. A.

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when you use a High-Speed

LINDE SWM-2

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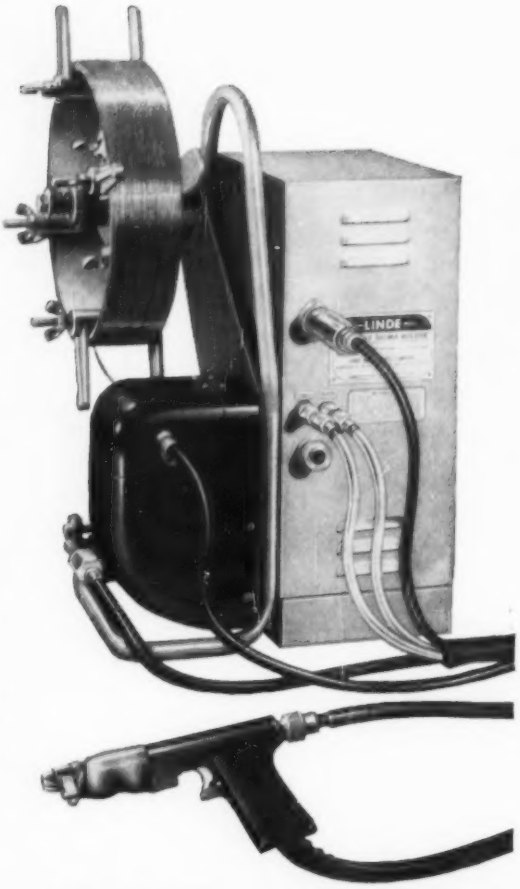
Portable Sigma Welder



Your welding department can easily make high-speed, low-cost fusion welds in aluminum, stainless steel, high temperature alloys, copper, carbon steel, and other metals with the LINDE SWM-2 Portable Sigma Welder. The LINDE SWM-2 is a complete control unit for manual sigma (Shielded Inert Gas Metal Arc) welding operations. It mechanically feeds welding wire from a coil into the weld area at a steady precontrolled rate and supplies a regulated quantity of argon to shield the weld from contamination by the atmosphere. No flux is used. In most cases the smooth, clean sigma welds need no post-welding treatment.

SIMPLIFIED AUTOMATIC OPERATION

The operator merely presses the trigger of the pistol type torch to energize the control circuit and start the flow of water coolant and argon gas. When an arc is struck by touching the consumable electrode to the workpiece, the wire feed automatically begins.

NEW CONSTANT POTENTIAL POWER SUPPLIES CAN BE USED

Either ordinary or constant potential DC power supplies can be used with a LINDE SWM-2. In constant potential welding arc voltages are preselected and held with outstanding consistency which permits positive starts and high-speed welds on thin metals.

Call your nearest LINDE office today for more information on how you can cut production welding costs with the LINDE SWM-2 Sigma (Shielded Inert Gas Metal Arc) Welder. Or write for your free LINDE SWM-2 catalog.

Production jumped 300% when the Heller Engineering and Manufacturing Company, Lynwood, California changed to sigma welding to fabricate aluminum engine shipping stands. Because the sigma welds were clean and sound, post-welding treatment was practically eliminated.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
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Division of Union Carbide Canada Limited, Toronto
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Linde
Trade-Mark

MICROHONING*

PRECISION

in millionths of an inch

MICROHONING is inherently the most accurate of all production methods used for stock removal. Four major characteristics make Microhoning the controlled abrading process—that produces precision in every part.

Low velocity abrading technique
—low speeds (50-250 SFPM) minimize heat and surface stresses.

Sharp cutting abrasive grits at all times
—the self-dressing action provides clean, constant cutting and uniform surface finish.

Self-alignment of tool with bore
—use of the "float" principle . . . either the tool or workpart has universal action . . . automatically aligns tool and bore to correct bore inaccuracies without changing bore location.

Large area of abrasive in constant contact with work surface
—cutting pressure is evenly distributed over the surface by the thousands of minute abrasive grits collectively removing substantial amounts of stock. There is no localized heat to damage the surface or sub-structure of the metal.

An aircraft hydraulic pump block component, made up of cast iron and hardened steel (58-60 Rockwell "C"); nine ported cylinder bores are Microhoned to obtain surfaces which will maintain a "running" seal and which will not gall or "pick-up." From .006" to .008" stock is removed from each bore while holding these tolerances:

geometry—.000025"
diameter—.000050"

Steel surface finish is held under 8 microinches; cast iron, under 10 microinches. Bores of both sections are Microhoned in line in the same operation.

For a more complete story on this application, write for CROSS-HATCH, Vol. 7 No. 4.

*MICROHONING = Stock Removal + Geometry + Size Control + Surface Finish

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

Another example

W-1138

W-1139

# of Blanchard versatility

No. 303 Stainless Steel Forging

653 oddly shaped, non-magnetic workpieces

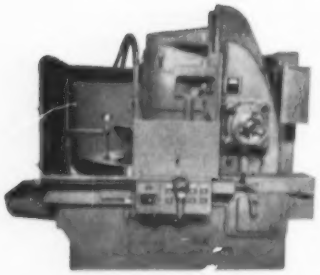
Blanchard Surface Grinders are noted for their unusual versatility – like grinding small, non-magnetic stainless steel forgings in quantity.

In the first operation, 653 forgings are loaded and blocked between rings on a No. 18 Blanchard, with 36" magnetic chuck (stock removal .010"). Parts, chuck and rings are sprayed with oil, and molten sulphur is poured around the parts to hold them. After grinding, the sulphur is easily stripped away.

This entire operation takes only 1½ hours – including preparation of the sulphur.

In the second operation, 44 pieces are set in a notched steel ring. Tilting the wheelhead and maintaining wheel pressure in one direction holds these non-magnetic pieces in the notches. Stock removal from this surface is .030", to tolerance of ±.003. Each load takes eight minutes – floor-to-floor.

As a result of this ingenious workholding, each piece is ground on both sides in a fraction of a minute, at less than 98¢ abrasive cost for all 653! That's typical of the convenience and economy of grinding on a Blanchard – whether the parts are magnetic or non-magnetic!

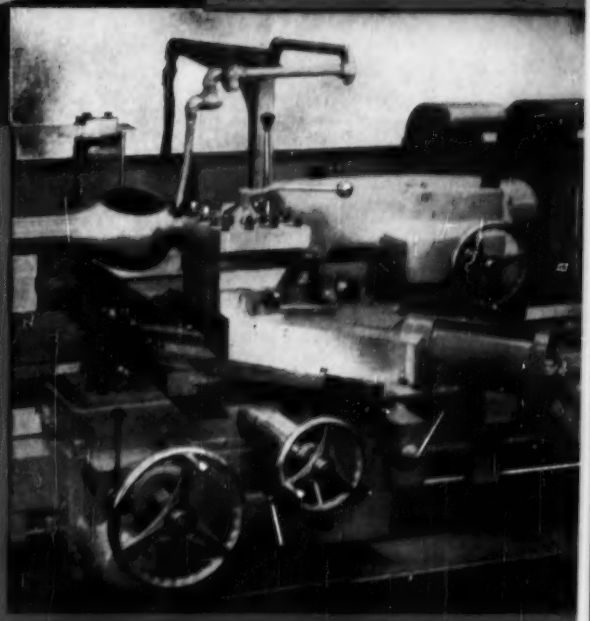


Send for free copies of "Work Done on the Blanchard", 4th edition, and "The Art of Blanchard Surface Grinding", 3rd edition – recently revised.

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

2 hrs. versus 9½ hrs.



This marine Diesel engine connecting rod is now roughed and finished from the rough forging in exactly 2 hours. It formerly required 9½ hours to do the same job.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

More production per man hour is the answer and the only answer to prohibitive costs—modern, high production machinery is the answer to greater production per man hour.

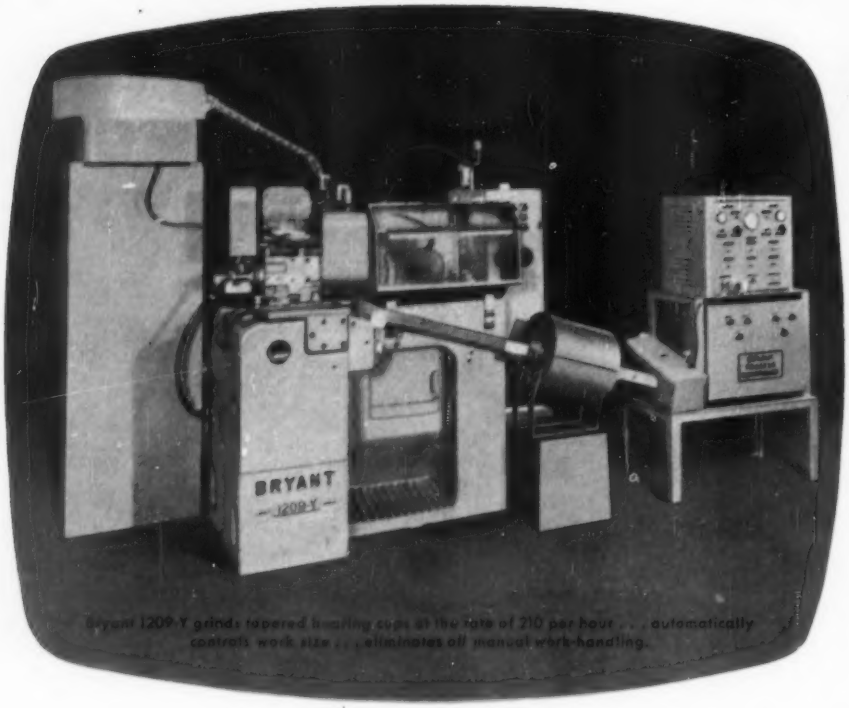
The astounding saving on this connecting rod job is the result of transferring it from previous equipment to a new 32-inch "AMERICAN" Hydraulic Duplicating Lathe. Such savings as this are not the exception but the rule when "AMERICAN" Duplicators are put on the job.

Bulletin No. 35 shows many such examples—it's yours for the asking.

THE AMERICAN TOOL WORKS CO. . **Cincinnati, Ohio U.S.A.**

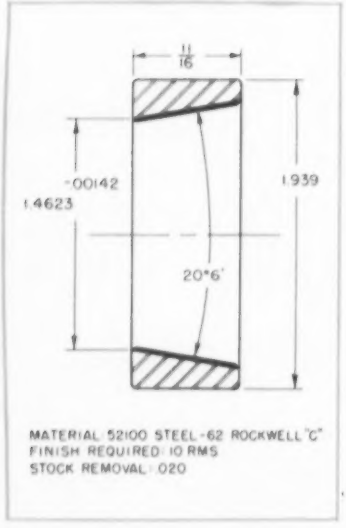
Lathes and Radial Drills

These extra features



Bryant 1209-Y grinds tapered bearing cups at the rate of 210 per hour . . . automatically controls work size . . . eliminates all manual work-handling.

. . . on BRYANT INTERNAL GRINDERS increase output, improve quality, cut costs!



Need volume production? small lot grinding? toolroom versatility? precision? Bryant grinders help you achieve *all four.* In addition, Bryant special equipment and features enable you to attain even broader flexibility and greater precision in your production.

Look into these Bryant cost-cutting features today . . .

- ***Bryant Process Controller*** — provides automatic statistical quality control.
- ***Bryant Air Sizing*** — provides automatic size control where extremely close tolerances must be held.
- ***Shoe Centerless Grinding*** — speeds up loading and unloading of work and eliminates distortion.
- ***Automatic Work Handling*** — allows integration into automated production lines.
- ***New Series 800 Bryant Hi-frequency Wheelheads*** — supply smooth, trouble-free operation and plenty of power for the toughest grinding jobs, at speeds from 10,000 to 100,000 R. P. M.
- ***Exclusive, adjustable precision alignment features*** — maintain original machine accuracy throughout the life of the machine.

Brya offers three methods of acquisition: 1) outright purchase, 2) conditional sale (short term or long term), 3) lease.

BRYANT

For literature or more information on Bryant machines, special equipment and financing plans, write:

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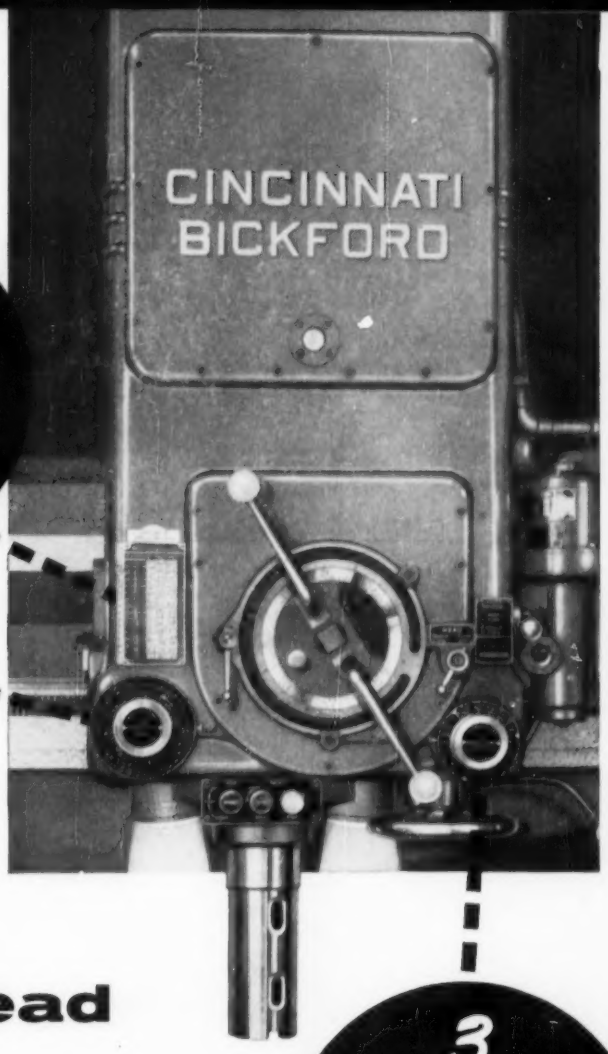
10 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates • Magnetic drum memory devices for computing systems



1. The Prescheduling Chart plans the sequence of operations . . . charts the proper speeds and feeds . . . is a permanent record of each tool diameter, speed and feed.

2. Speed Dial — Preselects any one of 36 speeds while machine is in operation—shift is automatic at end of each operation.

3. Feed Dial — Preselects any one of 18 feeds for next tool while machine is in operation — shifting is quiet and direct.

The HEAD that's way ahead

. . . brings you 3 outstanding performance features!

The concentration of complete control of all speeds and feeds by two easily read dials on the head is an outstanding advance in design.

Saves time — insures controlled correct operation — and is easy for the operator.

Hydraulic shift for speeds and feeds is quiet and positive. All mechanism for preselection is contained in the head. These ultra modern Super Service Radials have many other advanced features — for easy handling and high productivity.

Write for Bulletin R-33. You will be interested in the many new features.

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RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Subsidiary of GIDDINGS & LEWIS MACHINE TOOL CO. : Fond Du Lac, Wisconsin,

Cincinnati 9, Ohio, U.S.A.

WELDING SOLVES ANOTHER

and USS "T-1" Steel solves the welding problem!

Bedplates for modern color-printing presses have to be rugged—but as lightweight as possible. They must withstand constant pounding from printing rollers and cutting knives. And, since they move back and forth continually, they've got to be lightweight for fast, efficient operation. It is a good place to use a welded assembly of steel plates.

But that's where Graver Tank & Manufacturing Co., Inc., ran head-on into a tough fabrication problem. Alloy steel with the necessary strength and durability was difficult to weld. And with 534 welds on *every* bedplate, this was a king-size headache.

NO MORE HEADACHE!

Now the headache is gone. Production costs are down. And the finished bedplates are working hard and long . . . taking a tremendous daily pounding without distortion.

The solution? Just a switch to a remarkable *new* alloy steel, USS "T-1" Steel.

"T-1" Steel is very strong. Very tough. Able to take vicious impact abuse. Yet, it's easy to weld, "says Mr. H. McDonald, Superintendent at Graver."

HOW ABOUT YOU?

If you have tough jobs, rugged jobs, where you want to weld your way to lower costs, give this new steel a try. We think you, like Mr. McDonald, will find it the best thing you have ever used. Right now, "T-1" is in service and doing well in bridges, power shovels, steam turbines, electrical transformer tanks, flywheels, pressure vessels, mine cars, and lots of other places. Write for details. United States Steel, Room 5091, Pittsburgh 30, Pa.

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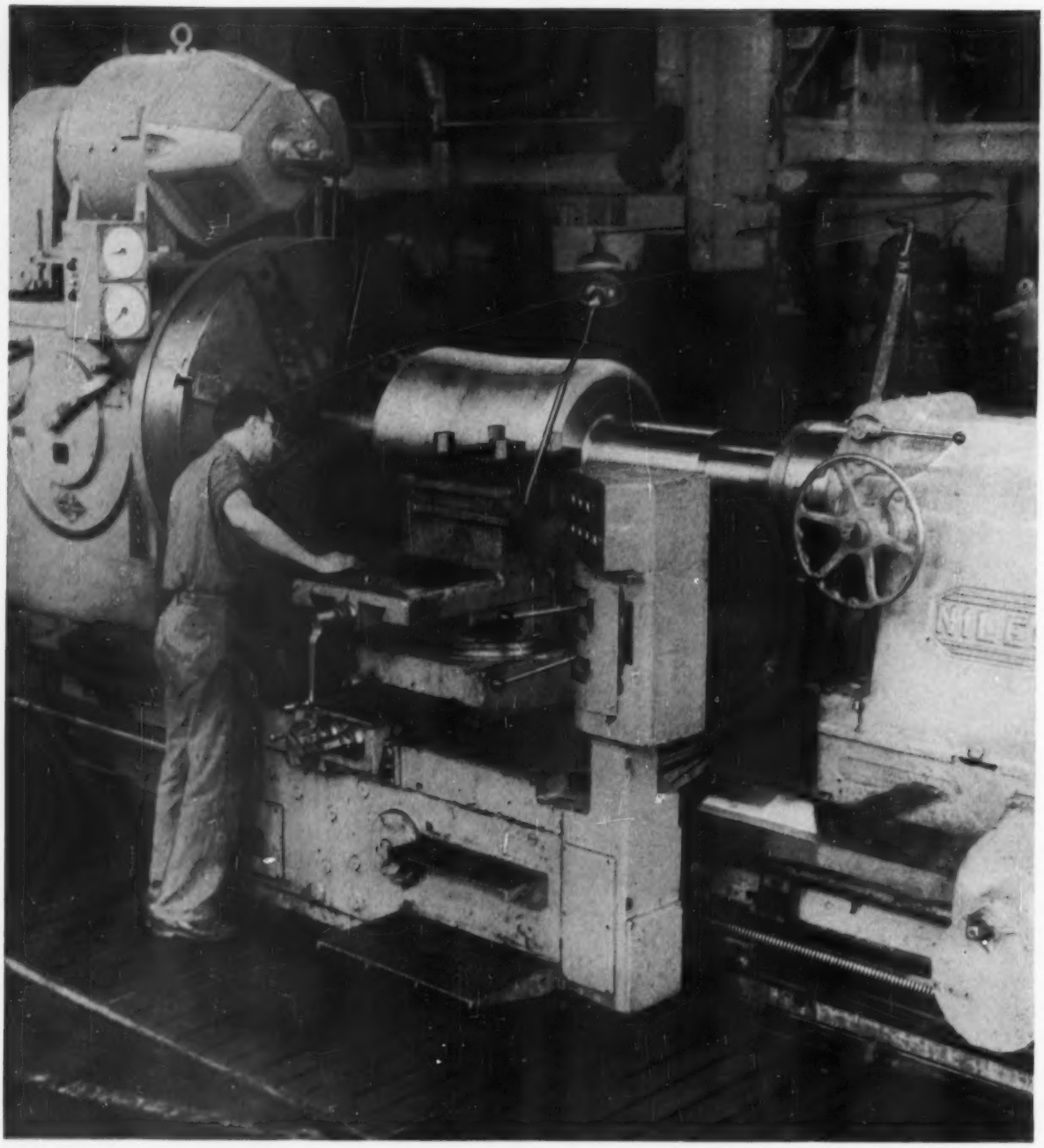
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

"TOP QUALITY!" That's how Graver Tank & Manufacturing Co., Inc., East Chicago, Indiana, describes new USS "T-1" Steel. It gives them a yield strength of 90,000 psi . . . exceptional resistance to impact abuse . . . and good weldability. It enables them to build extremely rugged, all-welded bedplates for printing presses.

WEIGHT PROBLEM

USS "T" CONSTRUCTIONAL ALLOY STEEL

UNITED STATES STEEL



NILES 60-in. lathe cuts machining time at National Tube

With this modern Niles 60-in. lathe, National Tube Division of U. S. Steel is cutting machining time on large rolls. In operation at the McKeesport, Pa. plant, it is combining excellent performance with exceptional accuracy.

This Niles investment will pay off. It's designed to withstand stresses and strains which go hand in hand with the exacting feeds and speeds required today. Pictured is a straightener roll for straightening seamless pipe being shaped by a mechanical contouring device fitted to the lathe's taper attachment.

You, too, could do many heavy-duty jobs better and faster with a Niles. May we mail you our new eight-page booklet on Niles machine tools? Please address: Hamilton Division, Baldwin-Lima-Hamilton Corp., Hamilton, Ohio.

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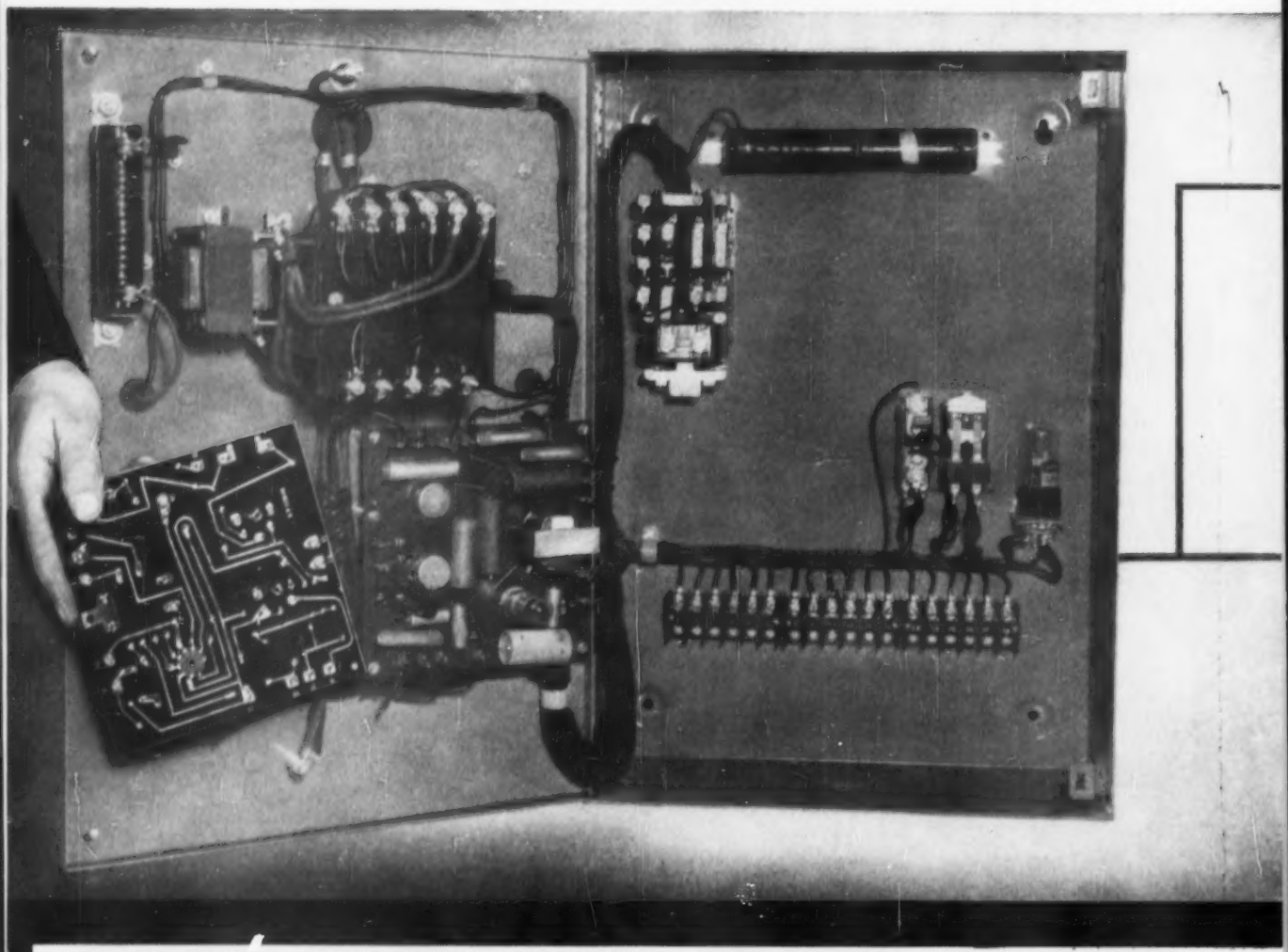
GENERAL ELECTRIC ANNOUNCES ADDITION TO THY-MO-TROL*

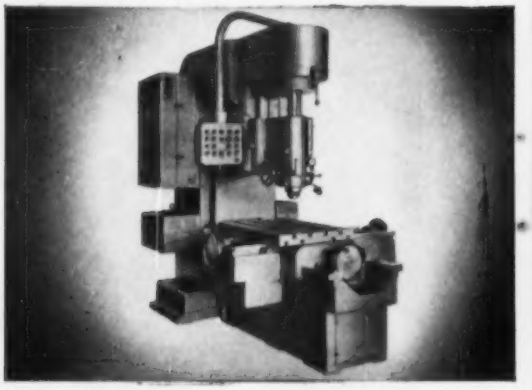
NEW Low-priced 3/4-3 HP



G-E THY-MO-TROL DRIVES ARE IDEALLY SUITED

Electronic Induction Heater. Thy-mo-trol Drive moves the carriage to exact pre-set conditions to assure uniform heat treatment.

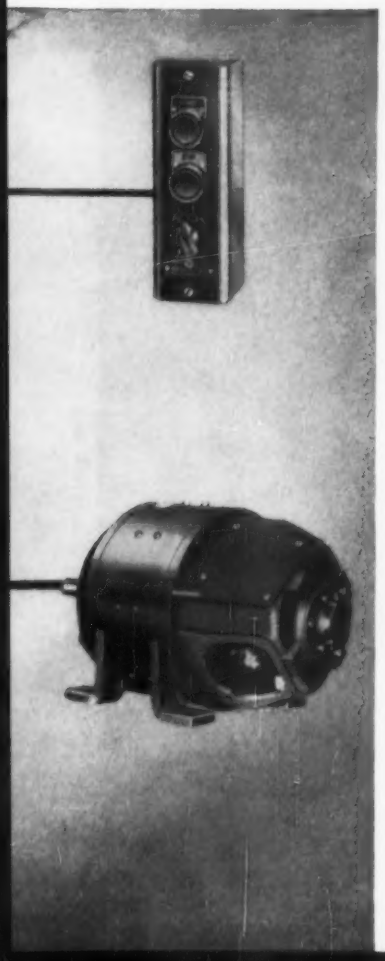
Surface Grinder. All motions on this grinding machine are controlled by General Electric's Thy-mo-trol Drive: spindle, table and cross-feed operations.



Milling Machine. Thy-mo-trol Drives automatically step up production on this milling machine by giving correct speeds for spindle, table and spindle head drive requirements.

DRIVE LINE . . .

Thy-Mo-Trol Drive with Printed Circuitry



NOW! FOR MACHINE TOOL APPLICATIONS —A RELIABLE, SIMPLIFIED, ADJUSTABLE SPEED DRIVE

These new, simplified General Purpose, 3/4-3 HP Thy-mo-trol Drives have been developed for industrial applications demanding wide speed range and close speed regulation. Embodying all the smooth adjustable speed characteristics of DC drives, the two models offer greater performance, reliable operation and wide speed range selection for many industrial applications.

A PRICE REDUCTION, due largely to G.E.'s industrial application of printed circuitry has been made. The entire control system has been simplified, giving the user substantial reductions in over-all weight, size, circuit complexity, amount of wiring, maintenance costs and installation costs.

OPERATING DIRECTLY FROM AC POWER, the new Thy-mo-trol Drives can increase machine production on most applications because they • Give the correct speed for the required operation • Reduce operating spoilage and rejects because of high accuracy performance and • Increase machine versatility because of the wide speed range and close speed regulation features offered.

THE COMPLETE THY-MO-TROL DRIVE LINE COVERS ratings from 1/40 to 30 HP and beyond. Speed ranges of 5:1, 20:1, 50:1, and 100:1 are typical. Speed regulation of ½ of 1% is possible over the entire speed range.

SIMPLIFIED FRACTIONAL HORSEPOWER THY-MO-TROL DRIVES are supplied as half-wave or full-wave units, allowing a wide selection of performance standards to meet each particular industrial application.

HIGH PERFORMANCE INTEGRAL HP THY-MO-TROL DRIVES, 3/4-30 HP, full-wave offer these superior performance features: greater flexibility, rugged industrial-type construction, easy maintenance, wide speed range, adjustable current limit, flat speed regulation and optional features such as: jogging, quick slowdown, reversing, dynamic braking, tachometer feedback and position synchronization all add up to qualify these drives for many machine tool and industrial applications.

FOR MORE INFORMATION on General Electric's Thy-mo-trol electronic adjustable speed drives, contact your nearest G-E Apparatus Sales Office or write for Bulletins GEA-6234, GFA-4089, GEA-5179, GEA-5827 and GEA-5337—General Electric Company, Schenectady, N. Y. 791-2

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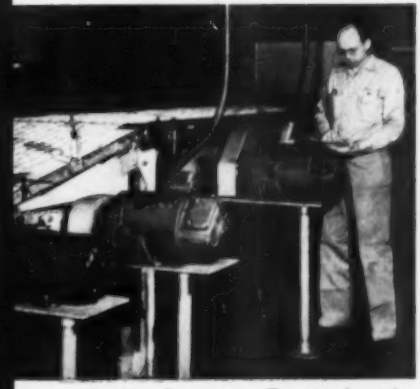
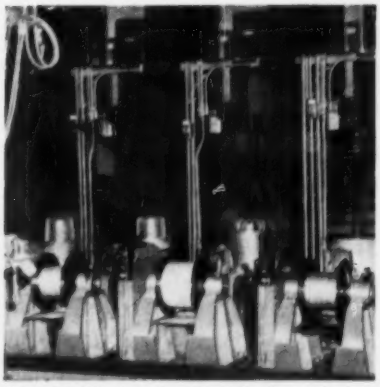
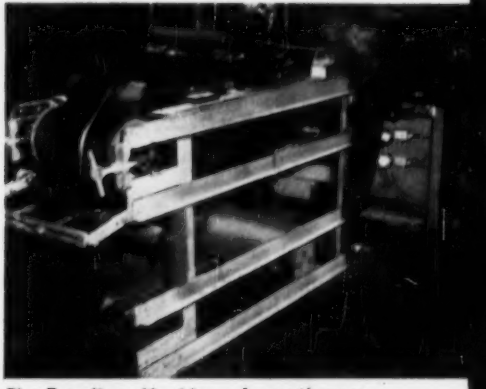


Cookie Conveyor. Repeated variations in speed—necessary to meet baking requirements—are easily handled by Thy-mo-trol Drive.



Wire Re-Winder. As the coil of wire builds up, Thy-mo-trol Drive continually adjusts speed of reel to maintain constant winding at maximum speed.



Tire-Treading Machine. A continuous strip of tire-tread passes from extruder (in background) to conveyor. Thy-mo-trol Drive synchronizes the operation.

The Success Story of **SPEEDKUT "A"**

. . . a boost for screw machine output!

The Success of SpeedKut A . . . is an oft repeated story of increased output, better tool life and less downtime. For SpeedKut A is one of Stuart Oil Company's balanced, general purpose cutting oils specifically designed for high speed machining of free-machining screw stock and brass on single spindle and multiple spindle automatic screw machines, turret lathes, milling machines, and hobbing machines.

SpeedKut A is a product of Stuart's sulphochlorination processing that provides absolute uniformity and stability. Highly effective chemical additive materials are pre-balanced under strict laboratory supervision to instill SpeedKut A with the anti-weld and friction reducing characteristics necessary to the range of machining operations for which it is recommended.

When selecting a cutting fluid, factors to be considered are material being machined, material hardness, speeds, feeds, depth of cut and machine design. Cullman Wheel Company, Chicago, Ill., a leading sprocket manufacturer, took all these factors into consideration more than 10 years ago. They chose SpeedKut A then and still use it for their multi-spindle automatics to cut sprocket blanks from free machining bar stock and for hobbing the sprocket teeth.

Your operation may be another link in this success story of SpeedKut A . . . or perhaps the factors that must be considered indicate a different type of balanced cutting fluid. "The Man in the Barrel", your Stuart Representative, will help you take all of the factors into consideration. Consult him. You'll be happy you did.

Write for Stuart's Cutting and Grinding Fluid Selector and Dilut-O-Graph Folder. It's a quick guide to starting recommendations for any job. Your name and title on a company letterhead is all that's needed.

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Mill circles and angles in one set-up with

tri-D
MILLING HEAD
KEARNEY & TRECKER
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Here, operator uses TRI-D Milling Head to perform a variety of intricate milling operations on a workpiece—straight, circular, angular, radii—all in a single set-up. Angular adjustment of cutter in vertical plane is an exclusive feature of TRI-D.

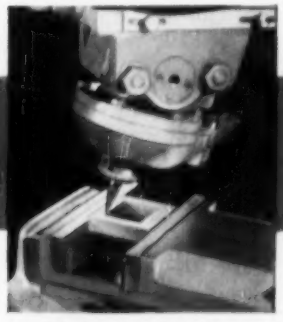
For tool rooms, die shops or production milling — — do it faster, easier with new TRI-D attachment

Kearney & Trecker's new TRI-D Milling Head — featuring rotary, lateral and angular adjustment in vertical plane — is ideally suited for rough and finish milling of various geometric shapes — straight lines, radii, circles, angles — all in a single set-up. It can be easily mounted on almost all horizontal and some vertical milling machines . . . *regardless of make.*

Illustrated here are some of the intricate operations the TRI-D performs.

Learn what the TRI-D can do for you — how different it is from all other types of milling heads in use today. For "proof-positive" demonstration, see your Kearney & Trecker representative. Contact him today, or write Kearney & Trecker Corporation, 6784 W. National Ave., Milwaukee 14, Wis.

Die (left) and punch (right) are rough and finish milled in a single set-up, using all three basic movements of the TRI-D and milling machine. Prescribed feeds and adjustment of TRI-D is all that's required to finish both workpieces.



Angular setting of TRI-D, with an ordinary end-mill ground to a specific angle, is used to mill the "square corners."

Kearney & Trecker CORPORATION MILWAUKEE 14, WISCONSIN
KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Builders of Precision and Production Machine Tools Since 1898

For more information on Kearney & Trecker's new TRI-D Milling Head, write for catalog No. TD-10. -/

New Case "400" Tractor, shown here, is setting new standards of tractor capacity, convenience comfort, appearance and over-all performance.

Many parts of YOUNGSTOWN Steel go to make Case's "new from ground up" 400 Tractor

Not often does a farm equipment manufacturer create an entirely new tractor. Such a change is costly—both in time and in tooling costs. But, the J. I. Case Company of Racine, Wisconsin, did it with the Case "400" Tractor.

Another thing that Case did was to make sure that the "400" would be a quality product. That's why parts such as 4th and 8th speed gear seat reinforcement, rear axle shaft, differential shaft, reverse idler gear, front wheel spindle and many others are of Youngstown Steel. These parts utilize 5 different Youngstown Steel products: Hot Rolled Alloy Bars, Hot Rolled Carbon Bars, Hot Rolled Sheets, Cold Rolled Sheets and Standard Black Pipe.

In all Youngstown Steel products, you will find the same dependable uniformity, because Youngstown controls the complete manufacture from start to finish, with emphasis on quality throughout.

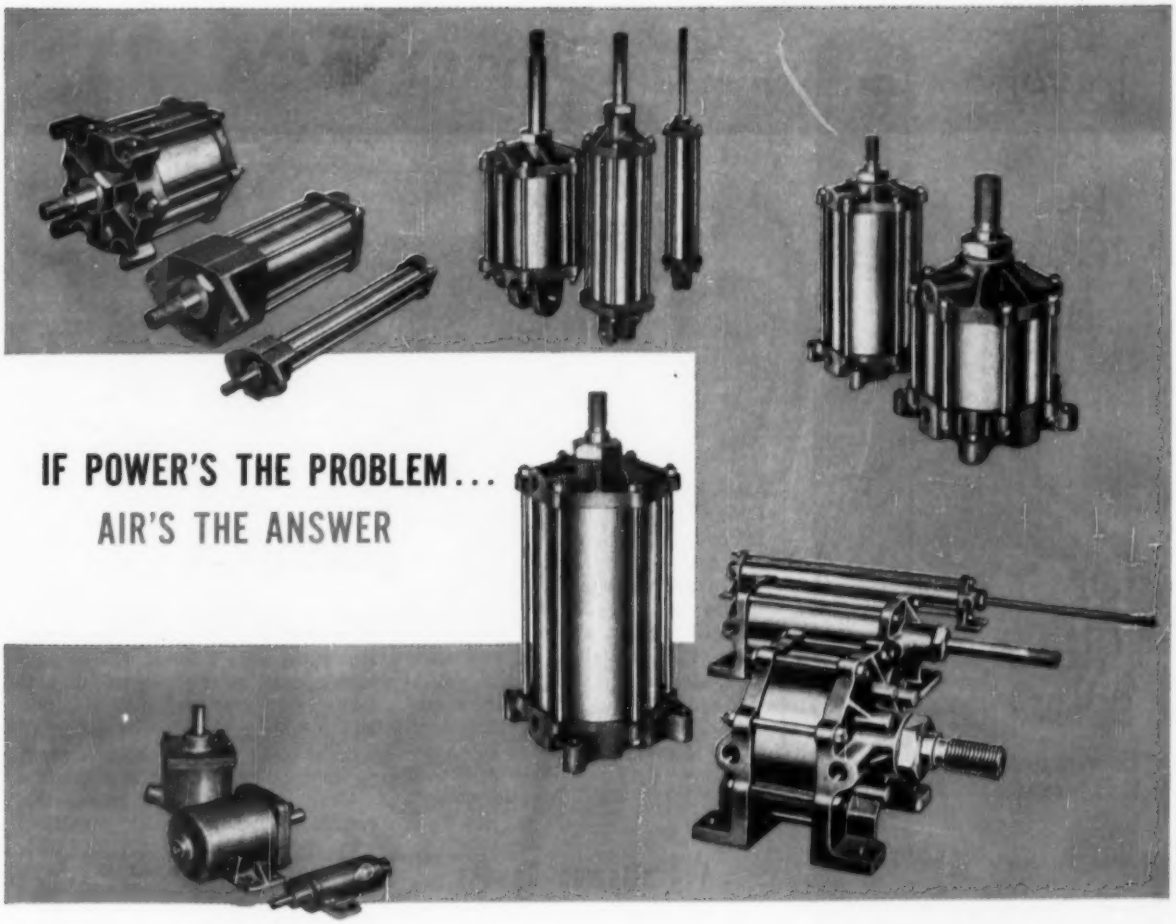
Let Youngstown help you with your steel problems. For information and service, get in touch with the local Youngstown distributor—or phone our nearest district sales office.

Youngstown

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS



Let Schrader air cylinders do the work

There is a Schrader Air Cylinder with power enough to meet any application. Ideally suited to pushing . . . pulling . . . lifting . . . lowering . . . wherever repetitive operations are required —Schrader Cylinders are used in innumerable applications in industries of all types.

Schrader has a complete line of cylinders that will meet any requirement. They are available in single or double acting, in bores up to 8" diameter, in any stroke, and in any type of mounting.

Schrader Air Cylinders will deliver controlled low-cost power to eliminate manual effort and for incorporation in automation designs. They make hard work easy and speed up production.

Don't forget, the complete Schrader line includes operating and control valves of every type, as well as all other compressed air accessories for air systems.

Write for Schrader Cylinder Specification Data or for information on the complete line of compressed air accessories.

Schrader
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LEADERS IN AIR CONTROL SINCE 1844

The complete Schrader line of pneumatic accessories includes everything you need

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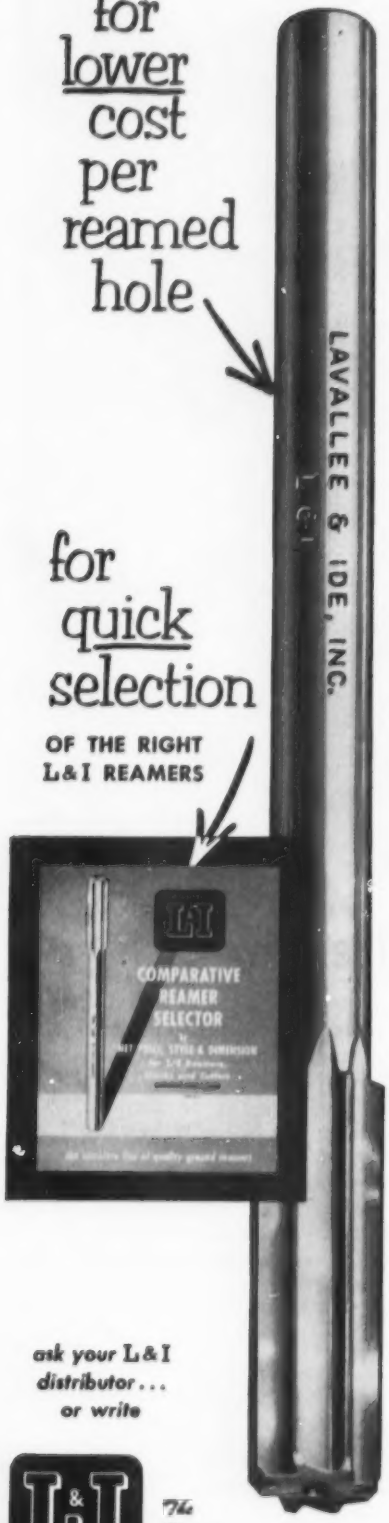

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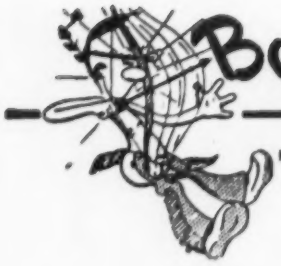


EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Hail the Mil

Belatedly, I read Mr Suverkrop's amusing letter on the subject of decimal inches with or without tears (*AM*—Sept 12 '55, p100). To me, however, it seems to be an anachronism to work at all with so large a unit as the inch, in this age of micro-inches.

If a change-over to the metric system (used in science but not in industry in this country) cannot be effected without a major revolution, at least the MIL (0.001 in., and not to be mistaken for a millimeter) should come into its own. Then the "tenth" would simply become the first decimal and everybody would be happy.

Max W Brauer
Toronto, Canada

A Craftsman Speaks

It has long been my contention that labor unions, as presently organized, were rapidly leading toward absolute dictatorship and the adoption of communistic principles. (Note that I spell this with a small c to show that I do not wish to imply that the unions are Communistic in the Russian sense.) The recent action of the newly formed AFL-CIO super-union seems to indicate that I was correct.

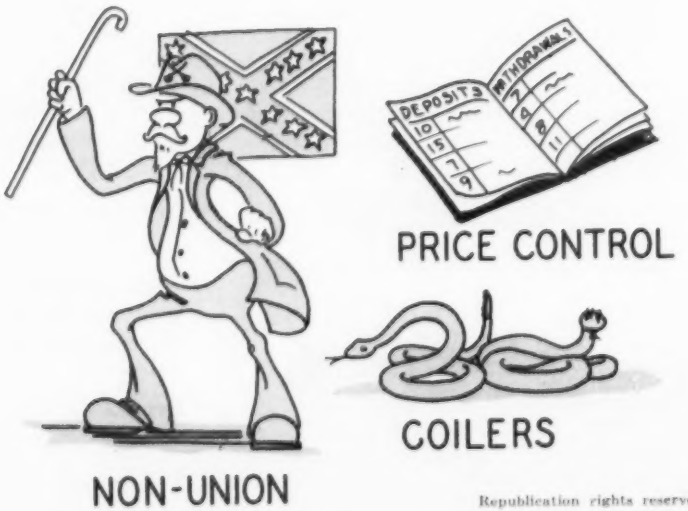
Its addiction to share-the-wealth resulted in a leveling process that pays no attention to the years a man has spent in training and study to develop himself into a skilled craftsman. It appears to believe that everyone should receive the same wage, regardless of his skill and ability. It seeks to turn all workers into labor units so that the man who has never had the ambition to advance himself will be paid just as well as the one who has. It seeks to destroy personal ambition and initiative and, by its paternalistic attitude to its members, seeks to treat all with strict impartiality.

Even under Soviet rules, this condition does not exist, for those who, by dint of exhausting their bodies, manage to exceed their work quota are granted special pay and privileges.

As your article points out (*AM*—Nov 21 '55, p177) members who have revolted against this leveling process and formed a Society of Skilled

GRINETICS

By D G SMITH



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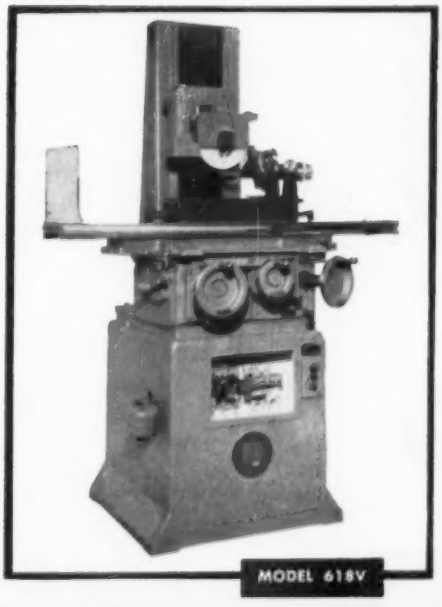
in the motor city . . .

REID GRINDERS set the STANDARD for ACCURACY



In Detroit, at Commando Tool and Die Co., positive accuracy is a must in grinding the high-production tooling necessary for today's automobile and aircraft production race. Commando and many other shops in the area have found that Reid Surface Grinders provide the built-in accuracy that spells top performance year after year.

You, too, can have the precision, the better surface finishes, the dependability and convenience of operation that are engineered into every Reid Grinder. So why not plan now to replace the over-age surface grinders in your plant with new Reid Grinders.

Complete details are contained in Brochure 618-1 — request your copy today.

Reid Brothers Company, Inc.

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✓NUMBERING
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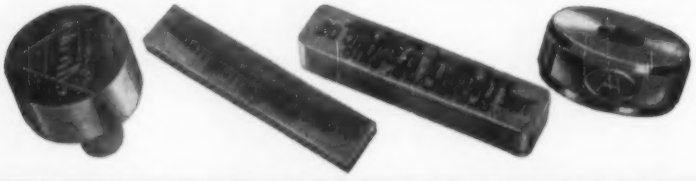
Noblewest is equally famed for fine marking dies . . . made to the most exacting standards of quality and with the all-important skill and know-how of master craftsmen. For good impressions and long service, only the very finest of steel, carefully heat-treated, is used.

Whatever your needs for marking, Noblewest makes the machines, tools and dies to do the job faster, better, at lower cost. For complete details write to Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.

A MARK IS ONLY AS GOOD AS THE DIE THAT MADE IT



MARK IT BEST WITH

NOBLEWEST IMPROVED MARKING DEVICES

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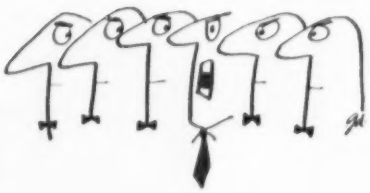
ORIGINATORS OF THE ROLL MARKING PROCESS

Trades are now denied the fundamental right to work. Our American Constitution guarantees certain rights, including liberty, but it would seem that our courts do not uphold this. Liberty is for the individual, and a man should have liberty to work where and as he will. It is not for the dictatorial group which should be denied the liberty to deprive a man of his liberty.

Originally, unions were formed to protect workers against exploitation and abuse by employers. They did a fine job and deserve all credit for it. But now they have become so powerful and overbearing that it has become necessary for some workers to form a new Society to protect themselves against exploitation and abuse by the union.

Mussolini brought prosperity to Italy and crushed the Communitsts, but became so swollen with power that he became more evil than the evil he had destroyed, and brought his country to ruin. Hitler was the savior of the German people until he, too, succumbed to the lust for power and brought death and destruction to the whole world. Let Reuther beware lest he fall into the same trap and end by bringing the entire structure of American industry crashing into dust and rubble.

R Hawksworth
New York City



Stay In Line

I agree with Fred Colvin (*AM*—Dec 5 '55, p100) that you can catch more flies with honey than with vinegar, but I am afraid he is just remembering the old days when management first became aware of the importance of employee relations. In these times, you are not permitted to "talk it over" with your employees; you must hold a meeting with the shop stewards and they will pass along the information in whatever garbled form they choose. If you dare to address your employees directly you will be accused of unfair labor practice and exerting undue influence.

If your old-time printers refused to join a strike today they would be

expelled from the union and probably be beaten up by the goon squad. And as for taking a group of men to look over living conditions in a "pirating" city, why they would be accused of "playing the boss' game" and perhaps of taking bribes. A new machine, of course, would be no problem—the union would simply say that the operator should get more pay because he was producing more work.

But talking things over with your employees is out of the question today. It would be a nice idea, but you are not allowed to be "nice" to employees — that's paternalism. You'll talk to the union, or you'll go out of business.

George Gaskell
Boston

You're Welcome

I wish to thank you for the article on grinding carbides (*AM*—Dec 5 '55, p134). It has solved a problem that was giving us a lot of trouble with burned-up wheels.

T Silvers
Detroit

A Look Ahead

The coming atomic age will bring the plastic age with it. Pure metals will only be useful in the cooling systems of such reactors. So plastics or metal-plastic alloys will be used. I therefore advise you to change the name of your magazine—well in advance now—to Metalplastic Production from Metalworking Production.

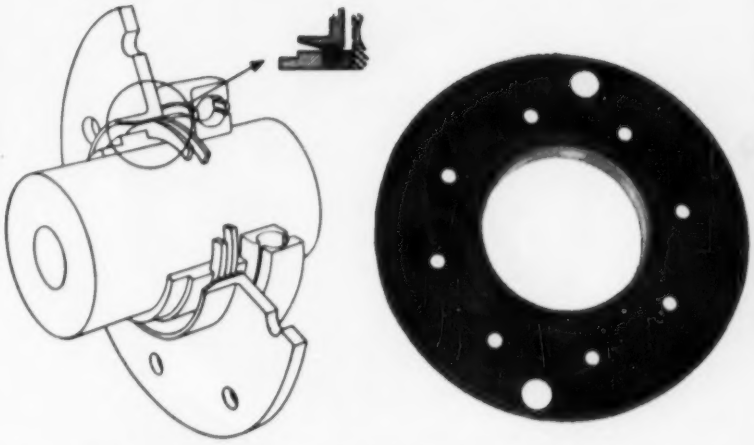
As heat has got no effect on casein plastic, and it can be pressed harder than steel, very good casein-steel alloys can be produced to meet anti-atomic and anti shaped-charge requirements, such as windowpanes, armor, and transparent, radarless, armored bodies for civil cars.

Enough unlimited explosives are available from free air. Solid, plastic, and liquid explosives are also in abundance. Vehicles can be moved by compressed-air system. This can be available from a container in the vehicle. The pressure in the container may be maintained for this purpose by explosions which can be fed by relief valve system automatically. A small container in this way can be enough. As soon as the pressure decreases, another explosion takes place inside the container to increase pressure. This may go on at any intervals needed by the size of the container and power required.

Mrs Sarot Sheel
New Delhi, India

FLP SERVICE MARK Design NEWS

News of Another Design Problem Solved With Flame-Plated Tungsten Carbide Coatings.



Flame-Plating solved the fretting corrosion problem which adversely affected the performance of the above turbine shaft seal.

Flame-Plating solves

"Fretting Corrosion" problems

When tightly fitting parts undergo a vibratory motion, surface failures often occur. One name for this phenomenon is fretting corrosion. In certain cases, where parts are required to operate with little or no lubrication, the effects of fretting corrosion are quite severe. Such was the case of the turbine aircraft engine shaft seal illustrated above. This design problem was solved by Flame-Plating the bearing surfaces with tungsten carbide. These Flame-Plated parts now give over twice the required service life.

Flame-Plating is LINDE's service performed in LINDE's plants for depositing a tungsten carbide coating on metal parts. Finished or semi-finished parts made of most metals can be Flame-Plated without distortion as the temperature of the part being plated does not exceed 400 deg. F.

Find out if Flame-Plating can solve your wear problems by calling your nearest LINDE Office today. Or write for your free copy of the Flame-Plating booklet.

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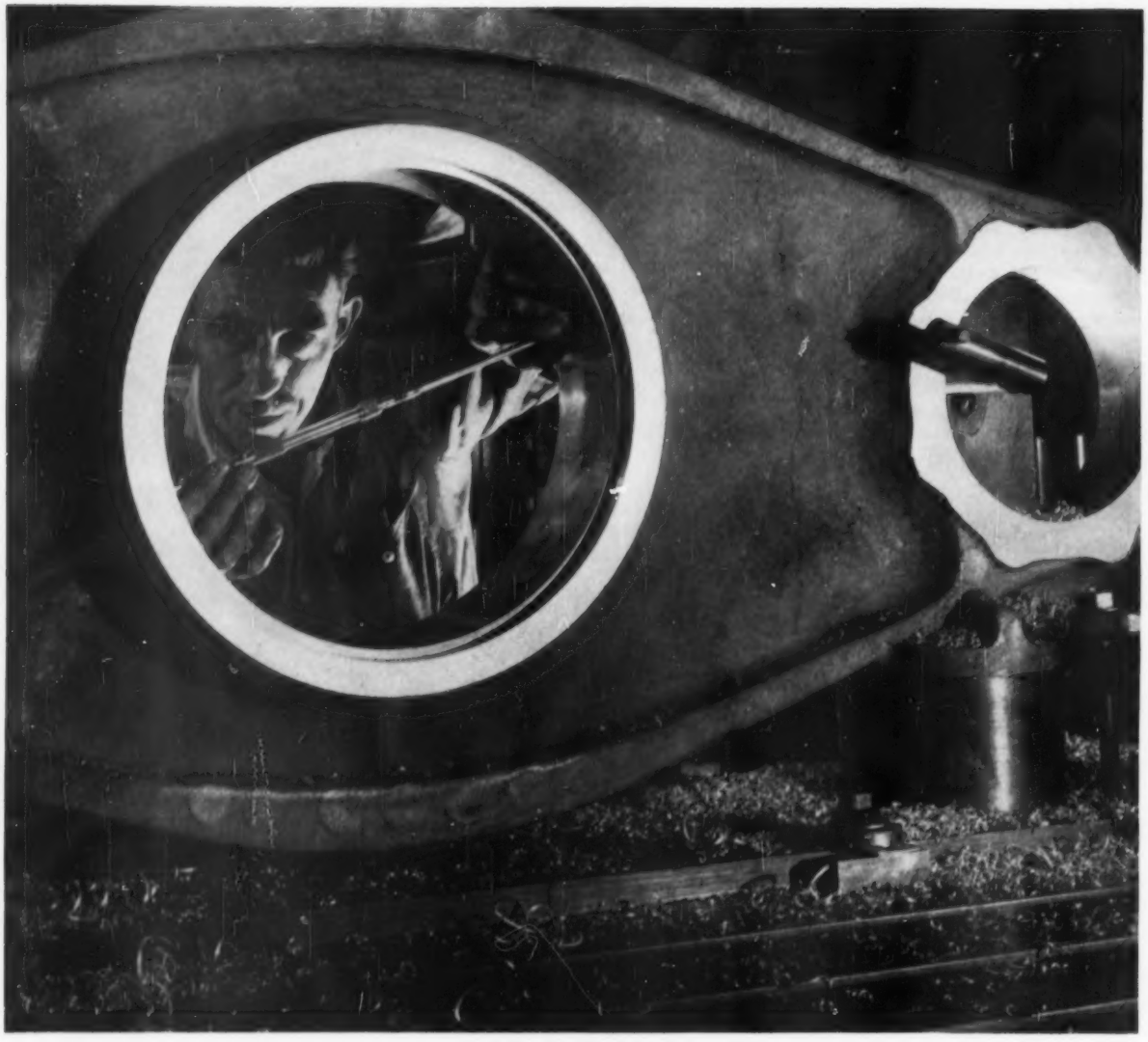


the surest thing in measuring—

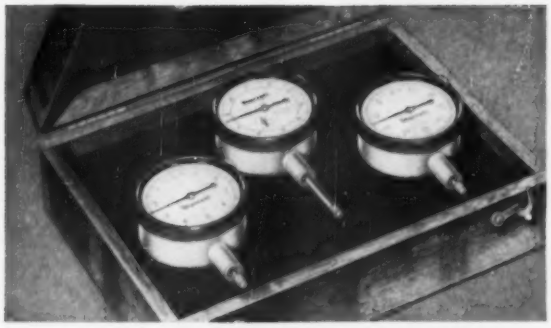
Starrett TOOLS

There's never an argument when it comes to precision measuring tools. Just specify STARRETT and you'll please everyone in the shop — from the tool crib supervisor to the rawest apprentice.

But why stop with measuring tools when there are so many opportunities to get the same quality and dependability in so many other Starrett products? Did you know, for example, that Starrett makes the world's most complete line of dial indicators and dial gages? Or that Starrett is among the largest producers of hack-saws, hole saws, band saws and band knives? Or that Starrett makes precision ground die and flat stock in over 1000 sizes?

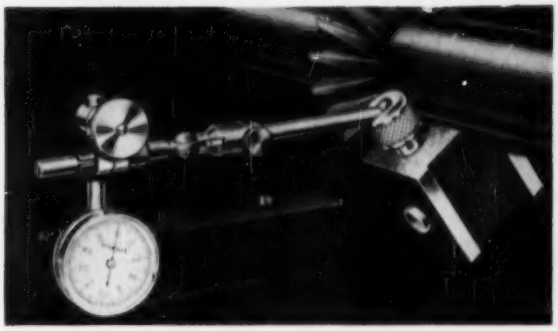
Your industrial supply distributor stocks the complete Starrett line. He can give you prompt, dependable service to match the quality and dependability of Starrett products. It pays in so many ways to specify *Starrett.*

WHEN YOU MEAN PRECISION YOU SAY STARRETT



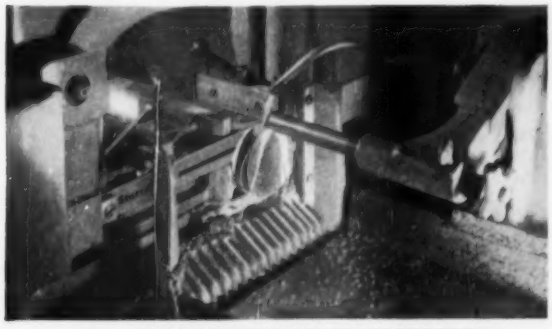
NEW STARRETT DIAL INDICATOR SET

Set No. 253 fills a long-felt need in small shops and big shop departments. Three indicators in handy mahogany case are graduated .001", .0005" and .0001". Ranges: .025", .125" and 1.000". Starrett also makes a complete line of high precision-low friction dial indicators.



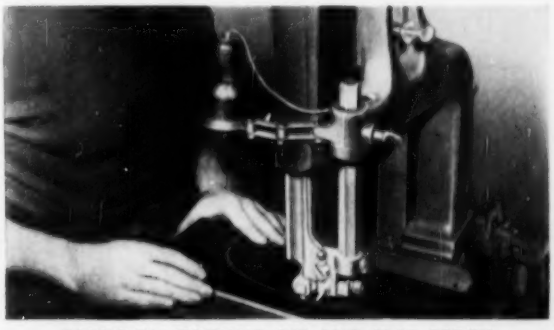
NEW MAGNETIC BASE INDICATOR HOLDER

No. 657 with off-on push button for one-hand operation has universal adjustment including sensitive fine adjustment. Holds firmly to any iron or steel surface. Mounts any "Last Word," No. 196 or No. 25 Series dial indicator.



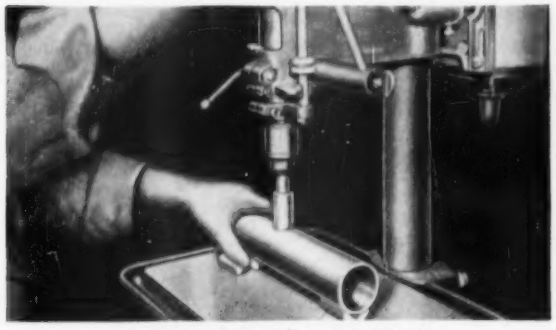
NEW PRODUCTION-PROVED HACKSAWS

Production-proved to give you better cutting performance, longer blade life . . . color identified to help you select the right blade for any job. These new Starrett faster-cutting, longer-lasting hacksaws are now available through your Industrial Distributor.



PRECISION GROUND DIE AND FLAT STOCK

Over 1000 sizes precision ground to Starrett standards of accuracy. Available in oil, oil and water, water or air hardening types. To save valuable man and machine hours, just "lay it out . . . and cut it out."



NEW SAFE-FLEX® HOLE SAWS

Use these new double-welded, shatterproof hole saws for cutting large diameter holes in metal, plastic, wood. Interchangeable arbors hold a wide range of saw sizes. Shanks fit portable power tools, lathes, drill presses, etc.

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Specially prepared for precision layout work. Dries instantly to an opaque, no-glare blue finish — won't rub or flake off. Makes scribed lines stand out sharp and clear. Handy 4 fluid ounce cans with brush in cap.

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design freedom

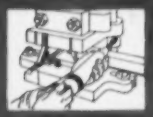
FEATURED IN THE EXPANDED DANLY DIE SET LINE

NOW Danly meets or beats all ASA standards . . .

with the world's broadest die [illegible]. There's no need for compromise between the set you want and the set you can [illegible] for costly specials. The new line of Danly Standard Die Sets has die space and guide post dimensions that equal, or *exceed*, ASA specifications. Under the new standards, front to back die space is measured *from edge of bushing to front of die set.*

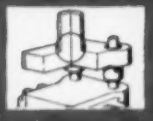
In addition to offering a complete selection of ASA standard die sets, Danly provides the Danly Standards proved popular over the years . . . all available from stock at your nearest Danly Branch. You can be sure of meeting all your die set needs at Danly . . . either ASA standard or Danly Standard.

NOW Danly offers you these additional features



Oil Lubrication System For Shoulder Bushing Sets. This new Danly die set feature assures longer life, easier maintenance, proper lubrication even during long runs.

All Horizontal Surfaces Ground On New Danly Die Sets. Horizontal surfaces, including top of punch holder and bottom of die holder, are ground to the same exacting precision as the inner die set surfaces.



Integral Welded Shanks. 100% weld on all-steel sets regularly furnished with shanks gives greater strength and rigidity. Deep counterbores in punch holder have less tendency to weaken set.

DANLY

DIE SETS AND DIEMAKERS' SUPPLIES

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue, Chicago 50, Illinois

Spot News of Metalworking...

- **"World's largest motorcycle factory" is being planned by Czechoslovakia** for that country's Second Five Year Plan (1956-1960).

- **"I look for the worst fourth quarter we have ever seen."** That's the prediction of a top automaker, made just before Christmas. If it turns out to be that bad when the returns are in, look for August-September model debuts in '56.

- **Foundries are infringing right and left on patented nodular iron processes.** Chief value of such patented processes was in getting the alloying material, but now with the material fairly easy to obtain, foundrymen acquire the techniques from plant visits or magazine articles, ignore the patentor.

Lack of metallurgists is becoming a crucial problem in U S metalworking, and it'll be even worse for several years to come. In fact, only 480 will be graduated from all U S schools and colleges this year — 100 fewer than last year.

- **Price differential between titanium bolts and ordinary aircraft bolts** is staggering. Convair, first airframe maker to use titanium bolts on a large scale, uses one Ti bolt that costs $3.65, compared to 6¢ for an ordinary bolt, but, says the company "they're worth every cent of it in weight saving."

- **Where does research end and production begin?** That question has caused a top level shakeup at Lockheed Aircraft. Company scientists felt they should help coordinate guided missile output from drawing board to finished product. The company felt researchers should stick to research, leave production to production people. Result: 10% of Lockheed's top research brass quit.

- **Current steel demand has reached the point** where standby and high cost steel production facilities are being put into service. Example: Sharon Steel's 400-ton-per-day Mary Furnace, idle for the last 14 months.

Radioisotopes are being used as trouble shooters to establish the reason for defective plating on wire. By dipping in calcium-45 before drawing and washing, it can be determined if the trouble lies in inadequate removal of drawing lubricant. Check for presence of lime is made by radiation counter, for presence of sodium by ionization counter.

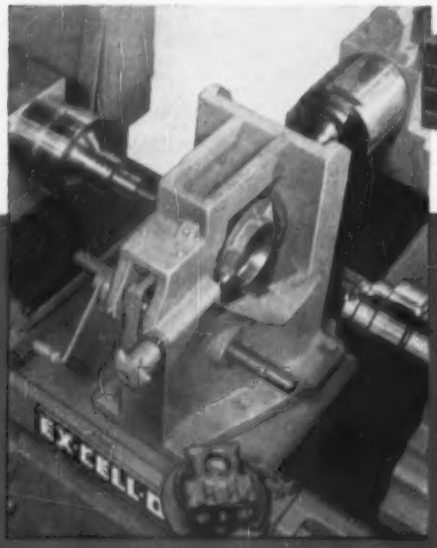
- **Plan to keep small firms informed on European technical developments** is being tried by Illinois Tech. For "less than the cost of paying a good researcher" IllTech will search European technical literature, carry out special technical commissions, make European contacts, channel back pertinent data.

- **Industrial construction in 1956 may exceed 1955's boom by 15-20%,** according to one contractor's field survey. Reported trend: because of automation, building shells will be tailored to fit the equipment instead of the equipment being fitted into a "monumental" building.

- **Autodom's Big Three will have to make room for the younger generation** in April. That's when the "Royal Achiever" comes out. It's a Dodge assembled by the Wyandotte, Mich, Junior Achievement group (12 boys and 12 girls) as a business project. Car will probably be auctioned to Dodge dealers. (see p125).

Ex-Cell-O 3-Way Precision Boring Machine. Standard way units—tooled to suit the work.

Note the simplicity of this tooling.



Cut Costs—Combine Operations

. . . INSURE YOUR PROFITS in Today's Competitive Market

Heavy lines show the machined surfaces. Small single triangles indicate single operations; double triangles indicate rough-and-finish operations.

Once a part is properly located and clamped, it's good practice to do as much machining on it as possible before it's moved! Related dimensions are held closer, handling time minimized and production increased.

This Ex-Cell-O 3-Way Precision Boring Machine performs 5 roughing and 18 finishing operations on a cast-iron crankcase used in the refrigeration industry. Tolerances are extremely close on the crankshaft and cylinder bores. Net production for the roughing operation is 33 parts per hour; for finishing, 36 parts per hour.

Ask your local Ex-Cell-O representative about all the other advantages of Ex-Cell-O Way Machines—or write today for Bulletin.

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55-44

Washington . . .

Defense policy disputes . . .

In the new year, the administration will face two hot political issues over the defense program.

First is the question of whether we're spending enough for defense. The Democrats charge the administration has scrimped on defense spending just to balance the budget. They claim this has allowed the Russians to catch up with us — and maybe even get ahead — on guided missiles, jet aircraft, and other new weapons.

Second is the clamor over how defense money is being spent. Say the Democrats: the administration has scrapped open competitive bidding in favor of secret negotiated contracts, and has allowed excessive profits on military procurement.

Push for competitive bidding . . .

Look for a big push in Congress to overhaul the Armed Services Procurement Act. House Armed Services Committee Chairman Vinson cites a report that 94% of the $36.4 billion worth of military procurement in the past 2½ years was handled through private negotiation, calls it 'shocking" and a violation of Congressional intent.

The law provides that "all" military procurement "shall be made by advertising," but that certain contracts "may be negotiated . . . without advertising if determined to be necessary in the public interest during the period of a national emergency declared by the President or by the Congress."

Vinson wants to tighten up this clause under which the heavy volume of negotiated procurement has been allowed, and step up the rate of military buying through competitive bidding.

Military budget outlook . . .

The fiscal 1957 military budget will call for $35.5 billion in expenditures. That's a billion over the latest official estimate for fiscal 1956 spending. On the surface, you might think the Republicans are boosting the military program in answer to the Democratic charges of Pentagon cutbacks to help balance the budget.

Actually, however, next year's budget does not mean a step-up in defense. It means only that costs of new weapons have gone up so much that the military must pay more to buy essentially the same quantities of arms they're buying this year.

Indeed, many Pentagon officials feel fiscal 1956 spending will eventually total more than $34.5 billion because of increased costs. Referring to the official effort to hold down military spending, one official says "we have to keep running just to stand still."

The Pentagon is expected to seek $35 billion in new money for fiscal 1957 — $2 billion more than appropriated this year. This, too, reflects increasing costs for the latest weapons. For instance, the supersonic F-100 Super Sabre costs three times as much as the old Korean workhorse, the F-86 Sabrejet fighter, which it is replacing.

Next year, more money will be earmarked for guided missile output — newer anti-aircraft and tactical land bombardment models are coming into production — and for research and development of long-range ballistic missiles. This will be at the expense of cutback procurement of tanks, trucks, artillery, ammunition, and other conventional equipment.

New "IRBM" project . . .

The Pentagon has ordered full-speed development of a ship-launched intermediate-range ballistic missile (IRBM) to carry a thermonuclear warhead at least 1000 miles at speeds exceeding 12,000 mph. To step up development, the Army and Navy are pooling personnel and facilities for the special project.

Most of the work will be conducted at the Army's Redstone Arsenal in Alabama, where a group of German rocket scientists has already developed a land bombardment missile called "Redstone" with a range up to 200 miles. Chrysler Corp is just starting production of this missile.

The Defense Dept believes Redstone's range can be increased at least five times and that a missile like it can be launched from battleships or other vessels.

That's why the Navy — which calls the project "Fleet Ballistic Missile" (FBM) — has been brought into the picture. Presumably, officials feel IRBM can be developed more rapidly than the Air Force's "Atlas" intercontinental ballistic missile.

While Atlas is being developed mainly by a team of private contractors, the new project will have little industry participation at this time. Main reason is the availabiliy of idle facilities at Redstone.

Automation report . . .

The Senate-House Economic Stabilization Subcommittee, which held detailed hearing two months ago on automation's social and economic implications, has come out with a report.

The finding: no need at this time for legislation to handle the problems of automation. But, said the group, "no one dare overlook or deny the fact that many individuals will suffer personal, mental, and physical hardships" resulting from the advances of automation."

The Subcommittee's report was worded in generalities, recommended that industry do everything possible to assure "a good, healthy, dynamic and prospering economy, so that those who lose out at one place as a consequence of progressive technology will have no difficulty in finding a demand for their services elsewhere in the economy."

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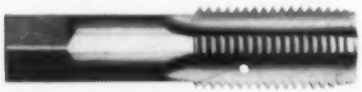
WHEREVER YOU ARE

Stop bucking inventory problems . . . when you need taps call your nearby Bay State Distributor. He'll make it his business to know your needs and to keep his shelves stocked with the right Bay State Precision Performance Taps and dies for you . . . he'll deliver when you need them, where you need them. Your tapping costs will drop, production and profits will rise . . . contact your Bay State Distributor today.



BAY STATE TAP & DIE COMPANY
MANSFIELD, MASSACHUSETTS

Turbine timetable shortens . . .

Turbine research people have been saying that two big problems must be solved before the average motorist will have one in his car — fuel economy and the production of turbine blades in quantities never before attempted, at a price that will fit into the mandatory $300 top for the entire gas turbine engine.

With those two big problems facing them, the people who work over the drawing boards have set 1965 as the probable date for introduction in Detroit assembly lines of the gas turbine . . . now it looks as if that date might be foreshortened by two or three years.

GM has a gas turbine . . .

General Motors will show, at the Motorama in New York on January 18, its "Firebird II," and from evidence obtainable at this writing the GM people have solved the fuel economy problem. General Motors says it has a "regenerator" — a metal mesh drum driven at 20 to 30 rpm (one-thousandth the speed of the turbine itself) that rotates first through the hot exhaust gas and then through the relatively cool compressor air, carrying heat from the exhaust to the incoming air.

The regenerator is supposed to be so efficient that it recovers up to 80% of the exhaust gas, which otherwise would be blown out and wasted. Exhaust temperatures going to the outside are lowered by almost 1000 F. GM says the exhaust of the gas turbine is "pleasantly warm."

A quick check of people in research on gas turbines — and every auto company is vitally interested in the program — brought this opinion: "This moves the whole program up two, maybe three years. It comes as a surprise."

GM has apparently whipped the fuel economy program — claiming its gas turbine has fuel economy on a par with piston driven engines (the turbine uses kerosene). Now the industry is turning its guns on the problem of mass production of turbine blades at the price the automakers insist upon . . .approximately 15¢ over the price of the metal per blade.

Other unusual items on the Firebird II . . .

The dream cars the automakers show from time to time usually have, somewhere on the car, new treatments that are destined to find their way into production in the very near future:

Take brakes . . .

With the coming of the smaller wheel (14-in. as opposed to the current 15-in. wheel. There has been much talk about maintenance of effective braking efficiency.

The Firebird will reveal an *all metal* brake developed by GM's Moraine Products Division.

This new brake operates by squeezing a rotating cast iron disk between pads of metal lining material. The disk has an air space between its braking surfaces, with blades that pump air centrifugally through the disk while it is spinning. Heat generated by the braking action is carried away on the air stream.

GM says no fade is present, even after a series of long, hard stops, because of the ventilation and the use of special alloy metal linings—which GM says retain friction characteristics throughout the range of operating temperatures. And they are unaffected by dirt or moisture.

Or take the body . . .

The new Firebird boasts an all-titanium body — the first time titanium has been used this way. GM says it has have overcome welding and grinding problems but details are not for publication yet.

The suspension system is a peek into the future. Individual wheel suspension has been combined with a new air-oil suspension system that eliminates springs and shock absorbers. The front wheel suspension is a double-wishbone: each rear wheel is mounted on a short stub axle suspended from the frame by a swing arm.

The transmission is mounted on the frame between the rear wheels and drives each rear wheel by a double universal drive shaft. To eliminate mechanical linkage problems between the steering column control and the transmission, GM uses a solenoid at the transmission itself to do the shifting.

Chrysler expansion:

Chrysler's recently announced "$1 billion expansion in five years" may be delayed a while, and may not equal $200 million a year for five years.

Chrysler insists it will finance the proposed expansion program internally. To do this, Chrysler will use (1) retained earnings: (2) depreciation: (3) tool amortization:

The tool amortization figure is reportedly pegged at about $100 million per year by 1959 or 1960 — a certain indicator that the program will start slowly and will accelerate non-proportionally in order to hit the tool amortization figure Chrysler talks about.

Chrysler spent nearly $125 million for tooling in 1955 — a figure that will be upped for 1956. So look for Chrysler expansion to start slowly and then finish fast and hard at the end of the five year plan.

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SUPER SENSITIVE VARIABLE SPEED • SMALL HOLE PRECISION drilling machine

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to drill holes (.004" to 5/16") in all drillable materials, to the most exacting specifications and on the most relentless production schedules.

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IT'S A **Hamilton Tool**
USE IT WITH CONFIDENCE

Machine Tools . . .

Turbine tool program strikes snag . . .

The government's reserve machine tool program has blown up higher than a Nike.

First, only a fraction of the $100 million provided for fiscal 1955 ever was spent. Most of the money is in the Treasury and will stay there. The second $100 million, for fiscal 1956, never got beyond the preliminary planning stage.

Now along comes an effective stoppage of the reserve turbine tool program which is strictly the child of the Office of Defense Mobilization and which is entirely outside the jurisdiction of Pentagon.

The Budget Bureau of the government has refused its approval of the release of funds to the General Services Administration to buy $35 million of machine tools for this program.

Money should come from Navy budget . . .

It claims that the money should come out of the Navy's budget and not from the Defense Production Act's Borrowing Authority.

Previously, ODM had set aside $70 million from the Borrowing Authority to GSA for procurement and maintenance of standby lines in the plants of eight marine turbine manufacturers.

Before any tools could be ordered, however, BDSA was asked to check the machine tool requirements to see whether any of the needs could be filled from government stocks.

BDSA certified $35 million of tools . . .

In November, BDSA certified the purchase of $35 million of machines for three turbine builders, with Westinghouse to get the biggest chunk.

But when GSA applied for the money with which to buy the tools, the Budget Bureau said a firm "no."

GSA now has asked ODM what to do. The likelihood is that nothing will happen. If the Navy wants the machines, it will have to dig into its own pocket to finance them.

That is exactly the position taken by some important ODM officials, but ODM director Flemming overruled them and approved the use of the Borrowing Authority money until he ran into the present snag.

ODM approves lease of 576 tools . . .

ODM has given its blessing, at least in principle, to the lease of 576 machine tools and other production equipment to General Motors' Allison Division at Indianapolis for non-defense work.

The equipment is now installed at Allison for manufacture of cross-drive transmissions and spare parts for combat vehicles.

Official approval of the lease, however, is being held up by a squabble over rental rates.

ODM wants the rental to be 1% of the acquisition cost per month. Defense Department, on the other hand, feels that the rent should be based on the age of the equipment: tools predating 1942 at 1%, 1942-1949 tools at 1½%, 1950-1955 tools at 2%. Commerce Department vigorously backs the Defense Department.

Under this schedule, 151 tools would be leased to Allison at 1% a month, and the remainder at higher rates.

Objection of ODM to higher rates is based on the fact that within the past two years ODM has authorized rental of idle machines at 1% to five companies.

Hence there is no reason why Allison should be made to pay a higher rate.

Machines to be bought for current production . . .

The apparent demise of the reserve machine tool program, explained away by Pentagon as directly an outcome of the change in military concept of what kind of future war will be fought, does not necessarily mean that the machines marked out for purchase may not be acquired anyway.

They will be bought for current production use out of the operating budgets of the armed services.

First instance of this is the announced purpose of the Air Force to order $52 million of long-lead-time machines, the same as those intended for standby, to be put to work as soon as built in aircraft plants.

Olympia Machine Tool Show in June . . .

International Machine Tool Exhibition is scheduled for Olympia, London, England, next June 22 to July 6, except Sundays. Nearly 300 companies will take part. Almost all western European countries will have machines on display. So will a number of US builders. As usual, foreign machines will be shown on the stands of their British sales agents and not directly by the manufacturer.

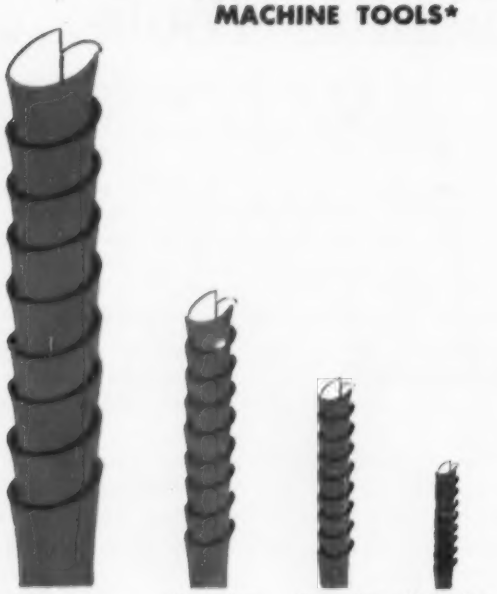
The show is sponsored by the Machine Tool Trades Association of Great Britain, of which William J Morgan is general manager.

1956 Leipzig Spring Fair will be held February 26 to March 8 in 33 buildings and 15 pavilions, with exhibits from almost 40 countries.

A number of companies from Great Britain, France, West Germany, Belgium, Italy, Netherlands, Switzerland and other western nations, including West Germany, will be represented.

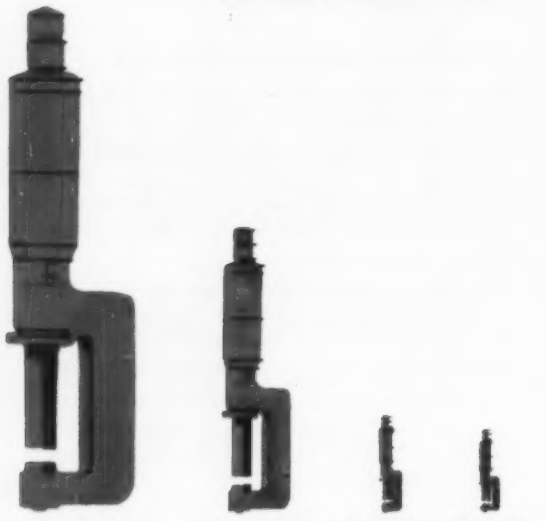
BF

MACHINE TOOLS*



American Machinist 1190 pages | Magazine X | Magazine Y | Magazine Z

INSPECTION AND TESTING EQUIPMENT*



American Machinist 106 pages | Magazine X | Magazine Y | Magazine Z

ABRASIVES*

American Machinist 109 pages | Magazine Y | Magazine Z | Magazine X

*All figures are for first six months of 1954

Advertisers tell more because production

CHARTED HERE is how, in the four magazines that carry the most advertising for products used and bought by Metalworking, the manufacturers of five very important product groups elect to invest their advertising dollars. The advertising for many other important product groups shows the same pattern, as does the combined pattern for *all* products bought by this biggest of industries.

Of these four magazines, the one that carries the most of this advertising is also the *only* one which is edited 100% for Metalworking's production engineers and executives . . . and *American Machinist* delivers far more such subscribers than any of the other three.

Conclusion: the cumulative judgment of Metalworking's suppliers is that *Production* is this industry's most important and influential buying group, and justifies

Bought by the Men who

CUTTING OILS AND LUBRICANTS*

American Machinist 91 pages | Magazine Y | Magazine X | Magazine Z

METAL CUTTING TOOLS*

American Machinist 258 pages | Magazine X | Magazine Z | Magazine Y

to metalworking production has the most to say about buying

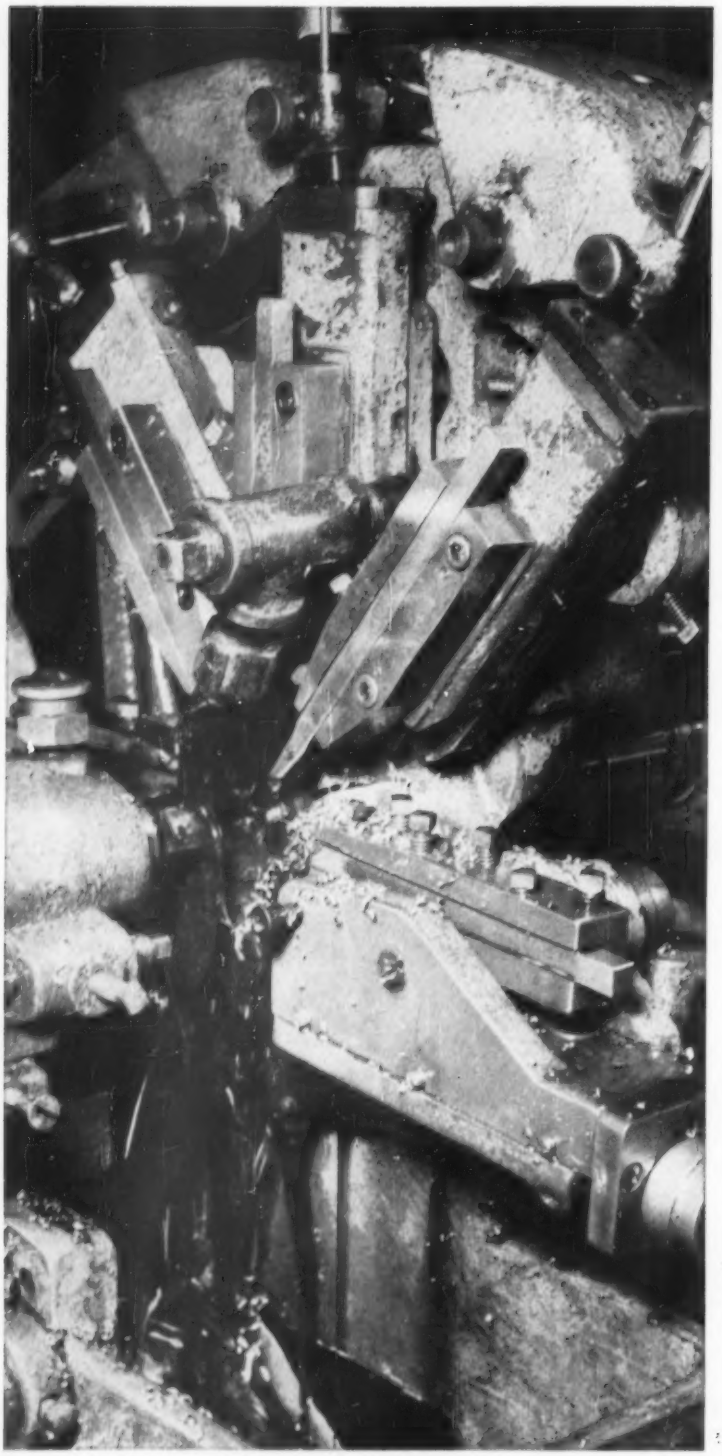
the greatest concentration of their advertising effort.

The reasoning behind this conclusion makes saleswise sense: no matter what the product you and any of *American Machinist's* 950 advertisers sell . . . a machine, material, part, service, finish, tool, or component . . . *Production* must use or apply it. And who has a more logical voice in a product's purchase than the men who must use it . . . apply it . . . make its purchase *pay off?*

The more you think about this, the sounder the reasons are for concentrating your 1955 advertising to Metalworking in *American Machinist.* To sell Metalworking with true efficiency, you *must* sell Production . . . and only *American Machinist* delivers 34,000 subscribers with a concentrated, self-evident interest in Production's problems and opportunities.

Buy Metalworking

The McGraw-Hill Magazine of Metalworking Production
McGraw-Hill Building, New York 36
Published Every Other Monday
Member of the Audit Bureau of Circulations and Associated Business Publications



"Cleartex helps us hold to close tolerances"

—says Mr. Jack J. Waldman, Plant Manager, Joseph Waldman & Sons, Irvington, New Jersey

HERE'S a plant that specializes in machining and threading intricate parts for the Watch and Aircraft Industries—working to very close tolerances. Mr. Waldman tells how Texaco helps:

> **"Our automatic screw machines are called upon to do some mighty accurate machining. We're glad we followed our Texaco Lubrication Engineer's recommendation and are using *Texaco Cleartex Oil* as both a cutting fluid and a machine lubricant. We find we get more pieces per tool grind, better finish, and lower unit costs. In addition, our machines are as clean as you'll find anywhere."**

Regardless of the metal being worked, or the method of machining it, there is a *Texaco Cutting, Grinding or Soluble Oil* to help you do your jobs better, faster and at lower cost. A Texaco Lubrication Engineer will gladly give you full particulars.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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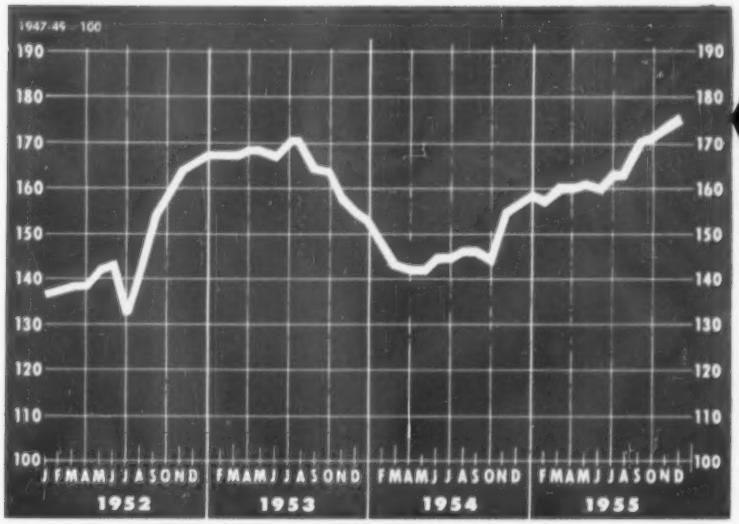
TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.

Gaging Metalworking . . .



Production Index

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	DEC. Estimated	NOV. Preliminary	OCT. Revised	NOV. Year Ago
Total Index	**175**	**174**	**174**	**155**
Machinery	146	145	122	
Electrical Machinery	202	207	199	
Autos	135	123	128	
Other Transportation	326	360	282	
Other Metalworking	145	145	128	

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

1955 peak rate being maintained . . .

The metalworking industries go into 1956 operating at or close to the peak rate achieved in 1955.

The outlook is for a higher rate of production this year than last. A close look at various segments of Metalworking turns up these facts:

Aircraft output will be up in 1956 from the past year's level, which in turn topped 1954 by 2% (for planes and parts combined).

New aircraft engine developments should mean high-level operations for the next three years, unless the military budget should be sliced again.

Construction machinery builders are in for a big year. Contract awards for heavy engineering projects the past year ran far ahead of the previous year, so demand for heavy equipment should be good in '56.

New orders for construction and mining machinery have piled up in a volume 40% ahead of a year ago.

Drop expected in farm machinery . . .

Farm machinery production in 1955 spurted 15% ahead of the 1954 total. New business was booked at a steady rate throughout the year. Dealers' stocks today are not high relative to sales. Nevertheless, demand for farm machinery the coming year will be off, and output is bound to be down too, thanks to shrinkage in farmers' incomes.

1956 will be another year of growth in office machinery. New orders for office equipment are 25% above the year-ago level.

Railroad equipment builders are going into their best year since 1951. Backlogs are close to 145,000 freight cars, compared with a slim 14,000 just a year ago.

Output of freight cars is expected to rise from the current rate of 4500 a month to 7500, which should be the average for the year 1956.

Big orders for electrical apparatus . . .

Makers of heavy electrical apparatus will turn out more goods in 1956 than the past year, when the dollar volume was 8% ahead of 1954. Most companies are booked to full capacity for the coming year. Orders from public utilities are expected to drop off this year, but will be offset by purchases of motors and generators by other customers.

Even after a whopping gain of 30% in production in '55 over '54, the electrical appliance industry is likely to average 5% better in '56. Main reason will be high consumer demand for new appliances in color.

Radio and television will not do as well this year as last. 1955 hit an all-time high. About 6.5 million TV sets will be made in 1956, against 8 million the past year (that still puts 1956 in the "big-year" class). Car radio assemblies will be less this year, following the pattern of automobile production.

Instrument and control business to gain . . .

Instrument and control manufacturers did not grow as rapidly as expected the past year. Smaller companies in particular had rough sledding. Nevertheless, total output was up 10% in 1955, and new orders are bigger than a year ago. Further improvement is looked for in 1956.

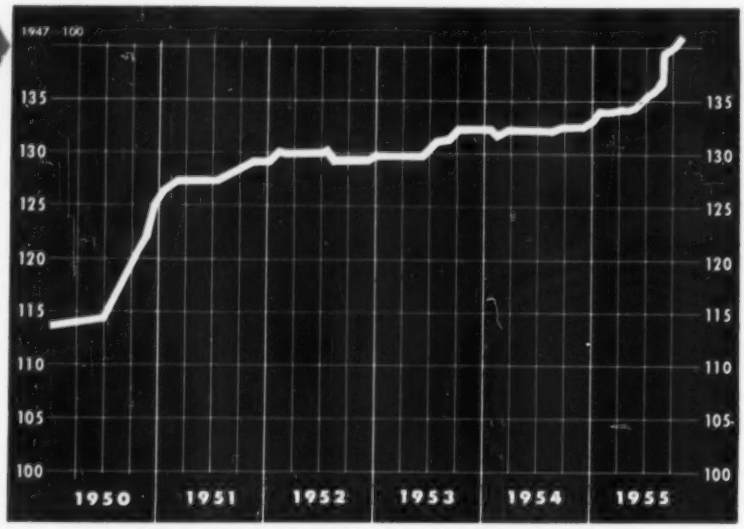
Automobile industry ended 1955 with a production of 9.3 million cars and trucks, an unheard of total.

Best estimate is that the 1956 figure will be 1 million less than in '55.

Gaging Business . . .

Price Index

	DEC. Estimated	NOV. Preliminary	OCT. Revised	NOV. Year Ago
Total Index	**141.6**	**140.6**	**139.9**	**133.5**
Metalworking Machinery	**157.3**	**157.2**		**143.1**
Other Machinery exc. Electrical	**147.1**	**146.6**		**137.6**
Electrical Machinery	**136.8**	**136.1**		**131.9**
Fabricated Metal Products	**135.5**	**134.7**		**130.3**



AMERICAN MACHINIST INDEX OF METALWORKING PRICES

Chemical people expect big year . . .

Here is a quick rundown of the situation in other industries than Metalworking:

Chemical people have had a big year. They are likely to have a considerably better year in 1956. Gains in plastics, synthetic fibres and agricultural chemicals will contribute to a 10% increase.

Petroleum refining is looking forward to an expansion of about 4% in sales the coming year. Output will have to match sales. The upturn will come from more consumption of industrial fuels and from greater gasoline usage by automobile owners. Demand for home heating oils will not go up as much in 1956 as it did the past year.

Paper industry to set new record . . .

The paper industry will have another record year. The upswing, however, will be more in the order of 5% than the past year's 15%. Paper production and industrial activity are closely related.

A moderate drop in business is in prospect for the rubber industry. The reason will be a considerable decline in tire production for new cars. To try to offset this, the industry will make a sales drive on tires for replacement purposes, industrial belting and chemicals.

Rubber output the past year was 25% ahead of 1954, which was a very poor year for the industry.

Lumber demand to be smaller . . .

Lumber people, like the tire industry, anticipate a slackening in '56. Lumber stocks, for one thing, are up to normal, following a big build-up in 1955 after an industry strike in the west during 1954. Housing will take less lumber this year than last.

Construction materials industry will feel the effect of about a 5% decline in the physical volume of construction in 1956. Residential construction, the largest single factor, will be off around 10%.

Furniture manufacturers probably will do 10% more business this year than in '55. That will be on top of a gain in 1955 of 10% over the previous year.

Demand for office furniture will more than offset a a lessened output of home furniture.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949 = 100)*	149.4	149.1	134.7
Steel ingot operation (thousands of tons)	2,353	2,421	1,726
Electric power output (million kilowatt hours)	N.A.	11,426	9,909
Production of automobiles and trucks	204,191	213,561	179,850
Engineering construction awards (*Eng. News-Record*—millions)	$458.4	$348.8	$324.5

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949 = 100)*	144	143	128
Index of durable manufactures production (1947-1949 = 100)*	163	162	142
Durable goods manufacturers' sales, millions*	$13,276	$13,692	$10,295
Machinery manufacturers' sales, millions*	$ 3,452	$ 3,474	$ 2,976
Durable goods manufacturers' new orders, millions	$14,039	$14,936	$10,790
Machinery manufacturers' new orders, millions	$ 3,917	$ 4,165	$ 2,915

* Seasonally adjusted
N.A. Not available

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IN 64,000 COMBINATIONS

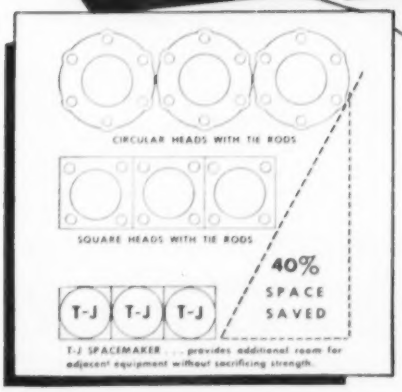
T-J

Spacemaker CYLINDERS

OUTMODE ALL OTHERS . . . SAVE 40% SPACE!

You'll never go back to tie-rod cylinders, once you apply T-J Spacemakers to your push-pull-lift jobs! Advantages in space saved, weight saved, greater strength and off-the-shelf delivery are among the dozens of Extras you get as Standard!

Now — these sensationally popular T-J Spacemaker Cylinders are available off the shelf *in sizes up to 8".* This means as many as 64,000 different combinations of styles, bores, strokes, mountings, etc. *immediately available!* Oil pressure to 750—Air to 200 P.S.I. Super Cushion Flexible Seals for Air . . . New Self-Aligning Master Oil Cushion. Hard chrome plated bodies and piston rods (Standard). Only from T-J can you get these new ingenious cushion designs! Send for bulletin SM-155-2. The Tomkins-Johnson Co., Jackson, Mich.


CIRCULAR HEADS WITH TIE RODS
SQUARE HEADS WITH TIE RODS
40% SPACE SAVED
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T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

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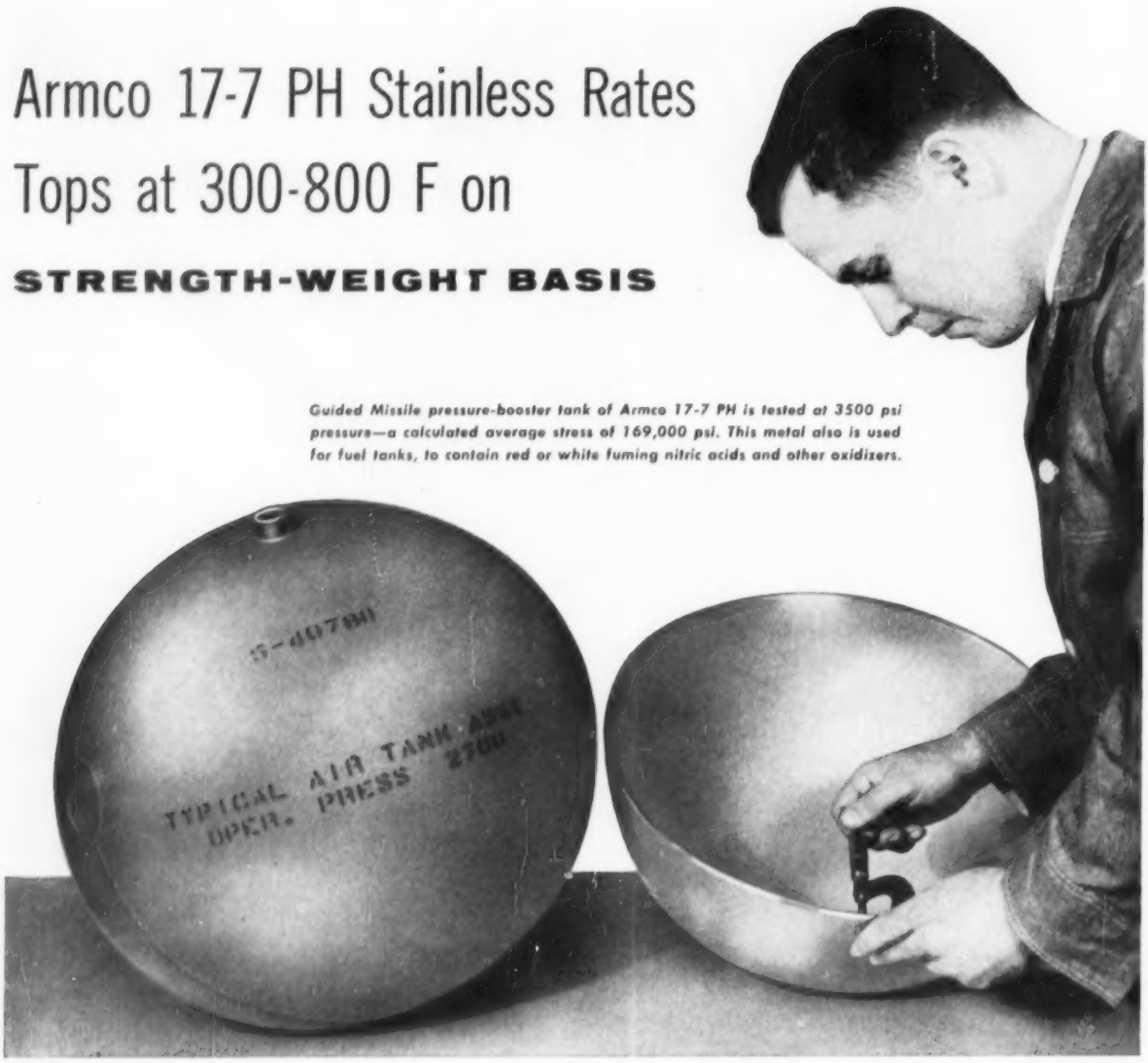
Armco 17-7 PH Stainless Rates Tops at 300-800 F on

STRENGTH-WEIGHT BASIS



Guided Missile pressure-booster tank of Armco 17-7 PH is tested at 3500 psi pressure—a calculated average stress of 169,000 psi. This metal also is used for fuel tanks, to contain red or white fuming nitric acids and other oxidizers.

On a *strength-weight* basis, Armco 17-7 PH Stainless Steel is unexcelled for service at temperatures of 300 to 800 degrees F. In this temperature range, Armco 17-7 PH has these pound-for-pound characteristics in comparison with the best ferrous and non-ferrous metals:

- *UNSURPASSED SHORT-TIME TENSILE STRENGTH*
- *SUPERIOR SHORT-TIME YIELD STRENGTH*
- *HIGHER STRESS-TO-RUPTURE STRENGTH*
- *HIGHER CREEP STRENGTH*

Yet Armco 17-7 PH is not a costly metal. It is well within the stainless steel price range. Besides having fine corrosion resistance, it is readily fabricated and welded in the soft condition—draws and forms much like 18-8 stainless steel. After fabrication, it takes only a low-temperature double heat treatment at 1400 F plus 1050 F to develop its high mechanical properties.

Armco 17-7 PH is supplied in sheets, strip, plates, bars, angles and wire.

For complete data, just fill out and mail the coupon.

Armco Steel Corporation, 1525 Curtis Street, Middletown, Ohio
Tell me why Armco 17-7 PH is unexcelled on a strength-weight basis for service at 300 to 800 degrees F.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Don't let it happen to you

None of us has to force a smile and to work up an unnatural enthusiasm in saying "Happy New Year" as we go into 1956.

Scarcely ever in history has the outlook for Metalworking been brighter. That goes not only for the next twelve months, but also for the next few years.

Capital outlay for new plant and equipment the coming year almost surely will shatter previous records. The durable-goods industries are entering 1956 with much bigger backlogs than they had a year ago. And their orders in the period ahead promise to bulk large.

Many consumer-goods industries estimate that 1956 will equal the past year's volume, and perhaps exceed it. People have plenty of money and are spending it freely.

No wonder metalworking men have a smile in their voices when they say "a Happy and Prosperous New Year to you and yours."

Along with this well-justified confidence, however, lurks a certain danger: The danger lies chiefly in a self-hypnotism brought on by a belief that we are in a boom era and business is bound to be good "regardless."

It is a good time to remember that few if any companies operate at the statistical average for their industry. The individual manufacturer is either above or below it. And chances are that just as many firms are below it as above it.

The question simmers down to this: What kind of a showing will you make in 1956? Are you going to be above or below the average?

Another question comes to mind: What is your competitive position going to be as you enter 1957? What you do the next year obviously will provide the answer.

If New Year's resolutions seem in order, **they might well spell out a pledge to make sure that your product is all that it should be, that it is so good that the customer cannot afford to be without it, that you make improvements in it the next year so that it will be up-to-date in 1957. And at the same time, make sure that you have superior new products coming along.**

Beyond that, you might resolve to maintain a research and development program as insurance that in this swift-moving technological period you will retain your leadership in the years ahead in the use of the newest and best materials and the newest and best manufacturing processes.

Your product, your plant, your entire organization—engineering, production, sales, over-all management—must be of the best if you are to get out of 1956 all that you should. This calls for a constant reassessment of what you are doing and how well you are doing it.

You probably have had these thoughts drummed into you before, but at the risk of triteness they are repeated here to emphasize that success in 1956 will not automatically come to you, no matter what you do or do not do, just because business activity in general will be on a vast and bountiful scale.

Boom times often have the druglike effect of lulling one into a happy stupor from which eventually there is a rude and shocking awakening. Don't let it happen to you.

Burnham Finney

EDITOR

this CINCINNATI PRESS BRAKE

is giving accurate and versatile performance at

UNITED STEEL FABRICATORS, Inc.

With ample capacity, this powerful 500 Series Cincinnati Press Brake with 18' 6" clearance between housings and 23' die area—handles formed structural bridge flooring, guard rails, steel doors, Girders, and side walls for various types of metal buildings are also produced.

United Steel Fabricators, Inc. are pleased with the accuracy in forming and ease and speed of operation which are important factors in this economical production.

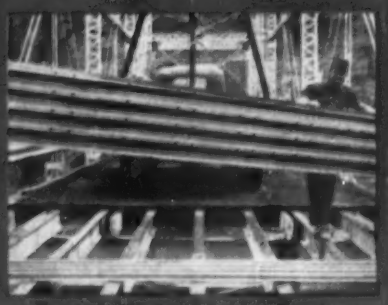
INVESTIGATE:

—Cincinnati Center Line Loading

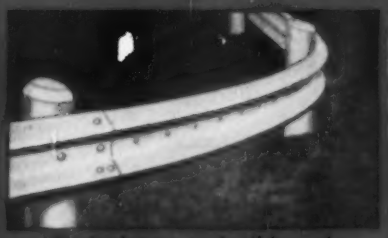
—Cincinnati Interlocked Construction

—Cincinnati Rigid Deep Beds and Rams

Write for the latest Press Brake Catalog B-4.

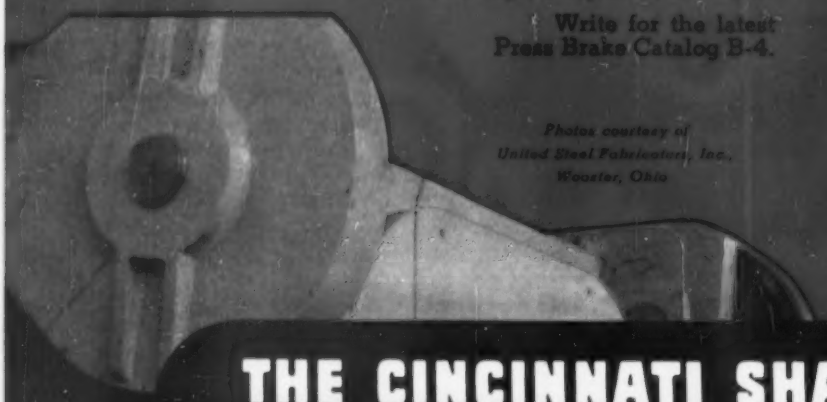


Formed structural bridge flooring



Barrier beam guard rail formed to any radius desired

Photos courtesy of United Steel Fabricators, Inc., Wooster, Ohio



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CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

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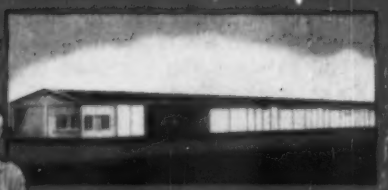


Permanent yet portable steel building

American Machinist

How to use fluxes and solders for good joints

Soldering is an exacting, sometimes time-consuming, operation. Yet, because it is one of the oldest metal-joining methods, very little time is devoted to improving the art. These materials, like most others, have a very definite interrelationship. Like the horse-and-buggy, solder and flux go together to complete the task. We suggest that some of these ideas may improve solder joining, or introduce it, in your plant.

W P McQUILLAN, materials engineering dept.
WESTINGHOUSE ELECTRIC CORP.
E PITTSBURGH

This article includes:

Corrosive vs non-corrosive fluxes
Composition of solder alloys
Effects of residual flux
Techniques for removing flux
Melting points for progressive assembly
Joint strength vs temperature
Electrical resistance of fluxes
. . . and many other details

Preparation for soldering begins with surface degreasing and cleaning. Mechanical or chemical removal of oxides permits a flux to provide protective covering from oxidation.

Fluxes fall into two broad categories: corrosive or non-corrosive. Corrosive fluxes have residues which attack the base metal or are sufficiently conductive to cause electrical breakdown across insulation after soldering. Fluxes containing hydrochloric acid, ammonium chloride, or stearic acid are corrosive. Generally, any flux containing a salt that forms an electrolyte is corrosive or electrically conductive.

Highly corrosive fluxes can solder alloys having oxides that are difficult to dissolve. They are also used in applications where the flux residues may be completely removed. This group usually contains zinc chloride, ammonium chloride and enough hydrochloric acid to prevent precipitation of zinc oxychloride salts.

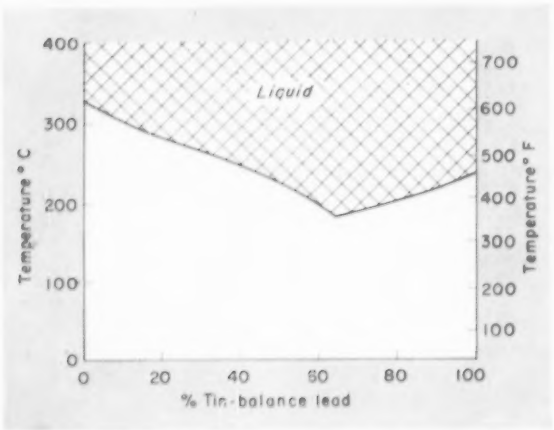
Corrosive fluxes are used mostly on mild, alloy, and stainless steel, on brass, and sometimes on copper. Oxides of stainless steel are difficult to dissolve so they are treated with an even more active flux containing stannous chloride. This flux chemically deposits tin on the metal surface before the solder melts, thus presenting to the molten solder a surface similar to one which has been electroplated with tin.

Residues from the corrosive flux must be removed from the joint after soldering. If not, they absorb water and form an electrolyte which would attack the base metal and provide a leakage path across insulation. An organic carrier does not make these fluxes automatically acceptable in the electrical industry. Nor does the term "neutral" in a flux

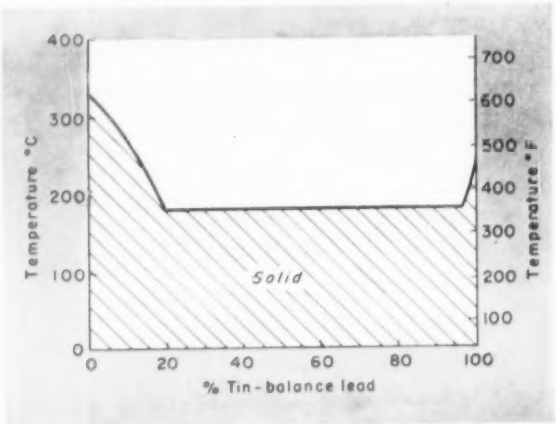
How to use fluxes and solders for good joints . . . Continued

FLUX	CONDITION	AS APPLIED	THICKNESS OF FILM	AFTER HEATING	AFTER CONDITIONING FOR 70 DAYS
Rosin dissolved in alcohol No additives	Dried	5000-26,000	0.004 avg.	—	73-160
	Heated to 250 c for a few seconds	5000-26,000	0.004 avg.	100,000-140,000	390-840
Hydrochloric acid solution of zinc chloride and ammonium chloride	Dried	.002-.02	0.004	—	0.1
	Heated to 250 c for a few seconds	.002-.02	0.004	0.06-0.09	0.2-0.350

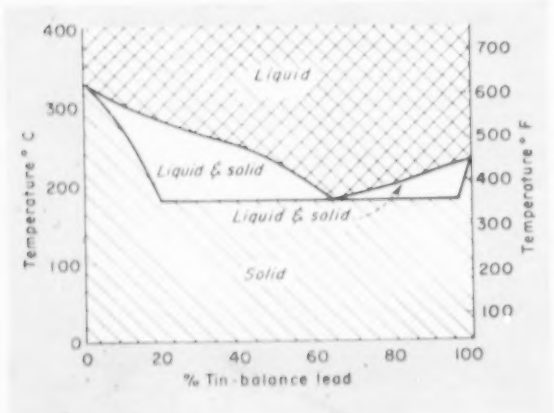
ELECTRICAL RESISTANCE OF FLUXES. Measurements were made on unheated, thin films of flux. Values were taken on films heated to and maintained at soldering temperature for a few seconds. All values are in megohms and the 70-day conditioning period was at room temperature and 90% relative humidity. Results are compared as shown. Absorbent insulation contaminated with flux has the same effect



LIQUIDUS LINE indicates temperature at which tin-lead alloy begins to solidify as it cools from liquid phase. Eutectic temperature, lowest freezing (solidification) point in the system, is 361 F. It is reached with an alloy of 62% tin and 38% lead, the latter approximate. Thus, this alloy requires minimum heat for joining; might be used for final assembly of soldered components

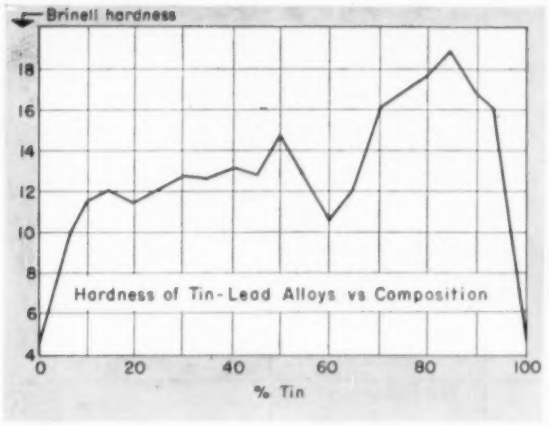


SOLIDUS LINE shows the temperature at which an alloy becomes completely solid on cooling from liquid phase, or begins to melt when heated from the solid state. Note the difference from liquidus line. Temperature of completely solid alloy is the same for compositions of from about 20% to approximately 97% tin

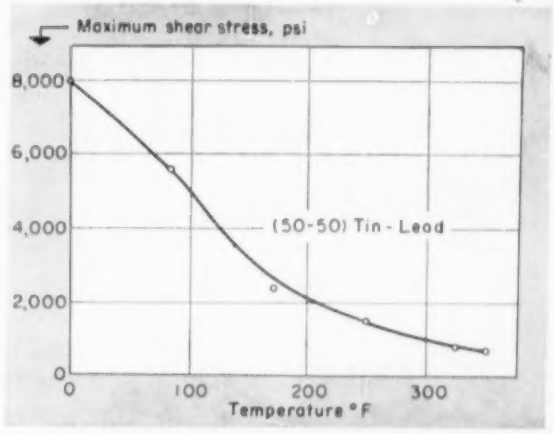


PLASTIC STATE is difference between liquidus and solidus boundaries; is extremely important in selecting composition to suit a specific application. This is a mixture of solid and liquid metal. Melting range of 40%-tin alloy is from 361 to 450 F. Long melting range is desirable for hand joining, cable sheathing, wiping joints, and where large fillets must be made. Eutectic is useful for tinning, sweating, or furnace soldering

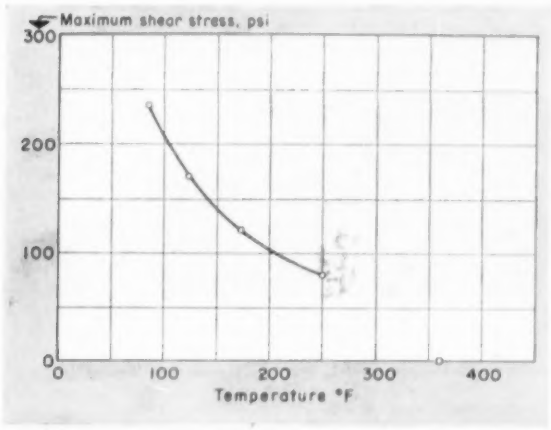
SHEAR STRENGTH of copper-to-copper joints increases with tin content of solder to a peak of 6100 psi at eutectic composition point. Tests were of short duration, with a strain rate of 0.060 ipm



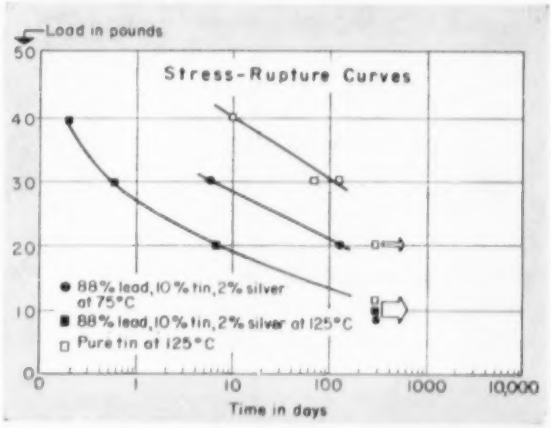
MAXIMUM HARDNESS occurs, not at eutectic point as does maximum strength, but at the point where the solder alloy is 83% tin. However, this still provides short-time shear strength above 5000 psi. Note sharp difference in hardness between 50%-tin and 60%-tin composition



SHARP DROP IN SHEAR STRENGTH of copper tubing joints occurs (for 50-50 tin-lead solder) as temperature is increased. Tests were pulled at 0.060 ipm



MAXIMUM SAFE STRESS for 50-50 solder joints is 1/25 of short-time-testing ultimate shear strength. In other words, a joint that will withstand brief loading up to 6000 psi at 100 F can only be expected to sustain a load of 240 psi over an extended period



SOLDER LOSES STRENGTH with time, depending upon composition. Creep-rupture tests were made on 1-AP soldered banding joints at varying temperatures. Pure-tin joints proved superior to those made with a lead base at the indicated temperature

name guarantee freedom from harmful effects on insulation or from corrosion of the base metal.

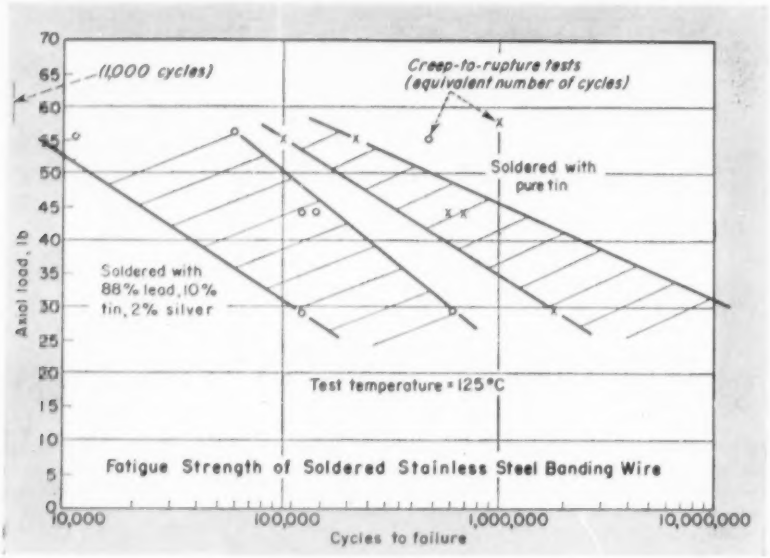
The non-corrosive group has, up to now, included only one material—rosin. Alone or dissolved in alcohol, rosin does not provide active cleaning, but is adequate for clean copper and silver surfaces or surfaces pretinned by either electroplating or hot tinning.

It is often possible to pre-tin coils or other parts for electrical equipment before insulation is applied. A corrosive flux may then be employed for tinning and may be thoroughly washed from the part. The weak rosin flux may be used for soldering after the insulation is applied.

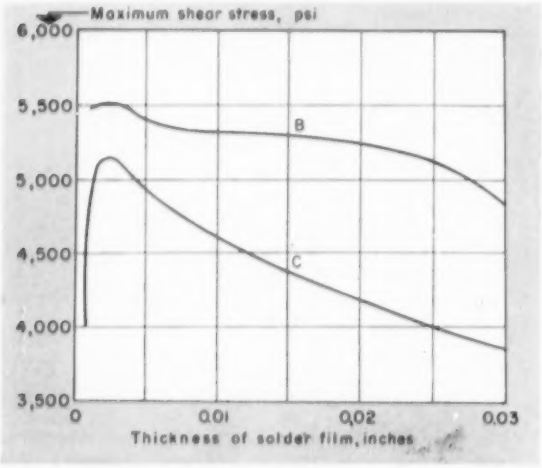
Sometimes copper pieces are bright dipped, rinsed, dried and coated with rosin dissolved in alcohol to protect the clean surfaces and provide a rosin flux for subsequent soldering. These parts must be dried thoroughly for storing, because rosin and copper react at room temperature to form a green discoloration when stored in a container from which alcohol fumes cannot escape.

The activated rosins form a new group of fluxes. These are composed of rosin in a solvent with added activators. Activators are ordinarily organic compounds with a halogen incorporated to provide better cleaning action and yet retain non-corrosive and non-conducting properties. Halogens in these fluxes are thought to volatize at soldering temperatures or to be rendered inactive in the hardened rosin residue.

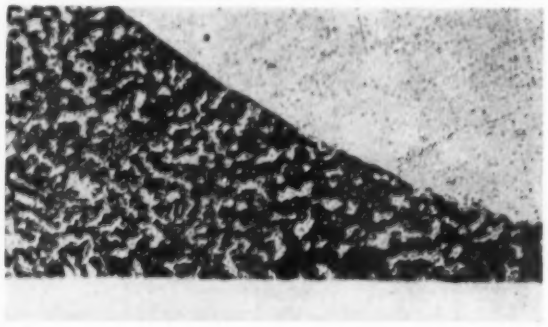
Generally, unheated activated liquid fluxes attack copper. Residue remaining after the flux is heated to soldering temperature may have a much higher electrical resistance than the unheated flux and may be essentially non-corrosive. However, any flux inadvertently splashed on equipment and unheated during soldering will be somewhat corrosive and have low electrical resistance. Reduction in cross-



FATIGUE, or repeated vibration, tests also showed that pure-tin joints were superior to lead-tin-silver joints. Scatter, caused by difficulty in producing identical wire joints for the test, is shown by boundary lines



IDEAL SOLDER THICKNESS for joints is 0.003 in. and an effort to maintain this dimension will pay off. Top curve describes 50-50 alloy solder; bottom curve shows effect on 20%-tin solder. However, it often is impractical to control joint thickness within close limits. Let job requirements decide. If beneficial, fixturing and furnace or induction soldering may help (AM—Aug 1 '55, p 89)



COPPER-TO-SOLDER JOINT, immediately after soldering

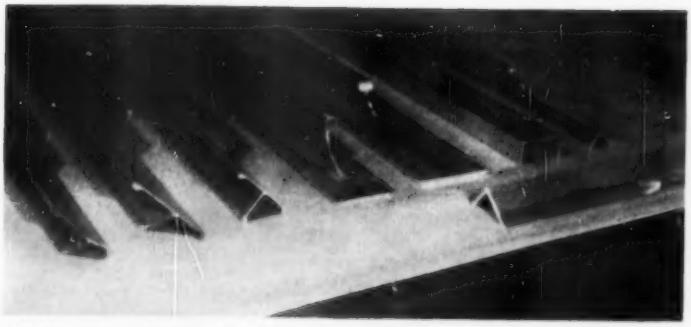
WIDENING OF COPPER-TIN ALLOY layer, after 15 weeks at 302 F, is caused by aging at elevated temperatures in service. Rate of embrittlement diminishes with a decrease in tin content of solder. Tin diffuses into copper to form a brittle copper-tin boundary

section of fine copper wires during soldering with active fluxes may result in breaking of the wire.

Solders are commonly lead-tin alloys with a melting temperature below 621 F.

In large electrical equipment, solders are generally tin-lead alloys. Lead-base solders (80% or more lead) containing silver are also employed. High lead concentration keeps the melting range at a high level. A 100%-lead solder, however, would not be suitable for high-temperature application because it is difficult to wet copper surfaces with lead. Small amounts of tin and silver additives assist wetting. Wettability of a solder increases with an increase in tin up to 50%. Then wetting appears constant.

Tin wets copper very well because of their mutual solubility, also forms an alloy layer with copper when soldered. Alloy composition varies from the solder composition through all phases of the tin-copper constitutional diagram to pure copper. Thickness of the layer is proportional to soldering temperature, time at that temperature, and aging time at elevated temperatures in service.

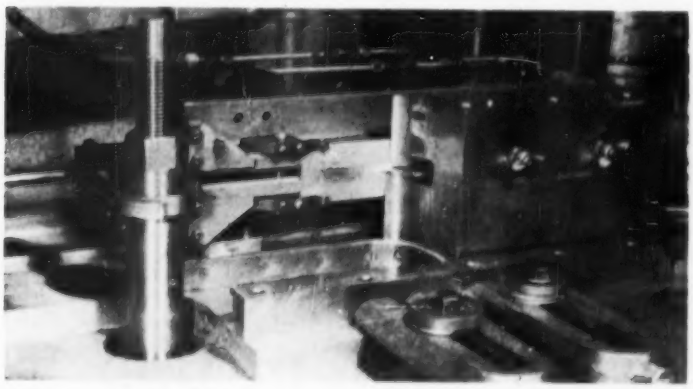


Ribbed aluminum extrusions . . .

. . . are pared down at ends to mate into flush-fitting assemblies. Savings with fixture were first estimated at only $40,000, but Engineering has been designing parts with fixture in mind, and it gets more use than originally planned

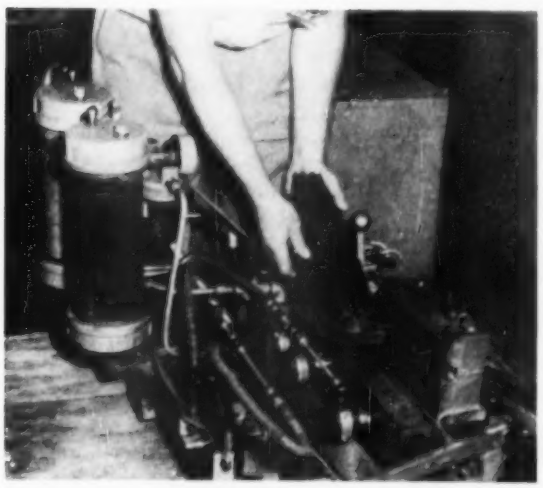
Lockheed is saving $75,000 with this shaper fixture

- **It clamps on the table of an ordinary woodworking shaper**
- **It grips and guides extruded shapes past a special cutter that pares down their ends**
- **It produces 187 parts/hr as against 14/hr the old pin-router way**
- **It eliminates expensive holding blocks, manual feeding, and rough edges**
- **It works with a combination of air and hydraulic power for smooth strokes**
- **It will save this much money during production of wings for the new Super Constellation**



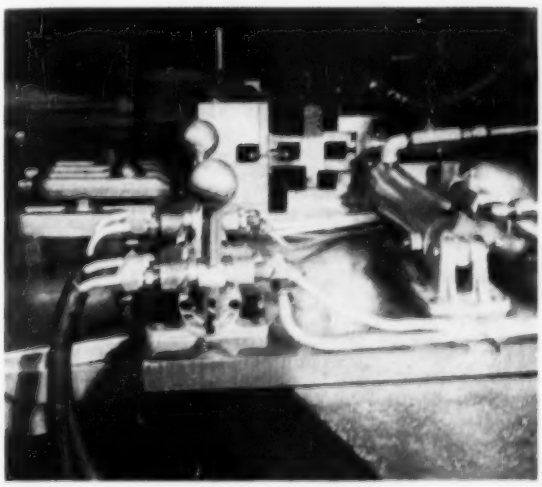
Setup on shaper table . . .

. . . is arranged so cutouts in fixture base and slide clear spindle (left). Cutter has two straight carbide-tipped blades, 3-in. dia, runs at 7200 rpm. Cutouts up to full 1½-in. cutter radius can be made on extruded stock, producing accurate edges. Slide strokes to left. Block with curved end is fixed fixture jaw



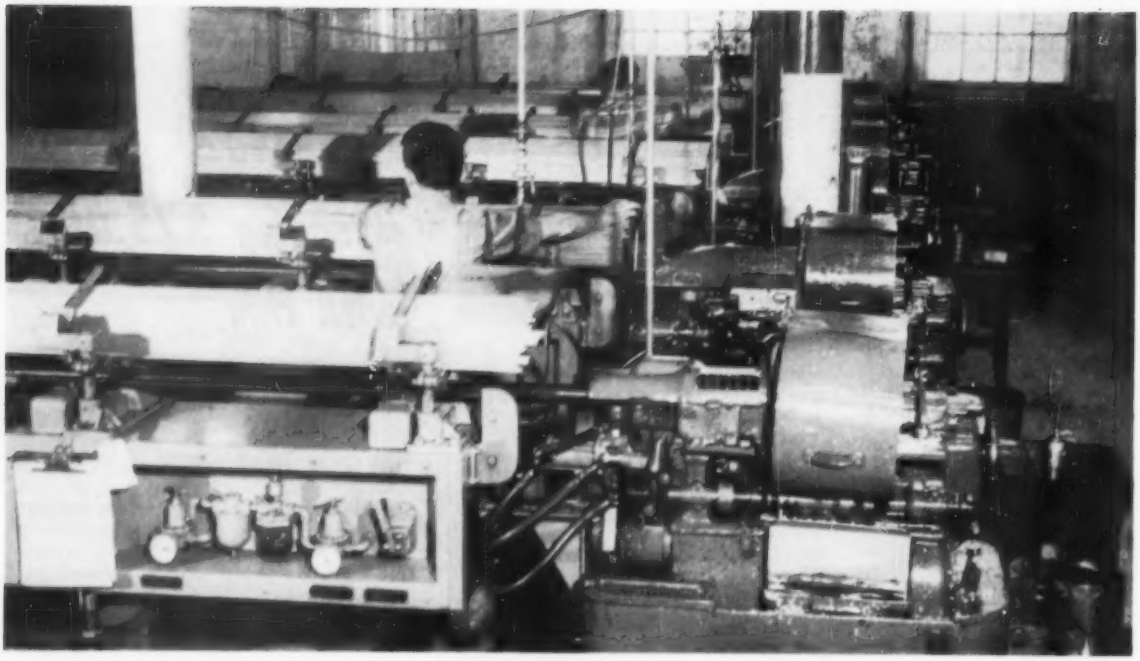
Four-way jaw . . .

. . . (being removed at bench for setup change) grips almost any extrusion with walls up to ½ in. because of slots and shoulders. Two vertical cylinders (left) are oil reservoirs under full (100-psi) air-line pressure, and feed slide-stroking hydraulic cylinder (rear). Three horizontal air cylinders (center) develop 900-lb force to clamp part in fixture jaw. Slide has adjustable stops, max stroke of 6 in.



Workpiece clamped by four-way jaw . . .

. . . is moved (to rear of photo) on slide by hydraulic cylinder (foreground). Two valves (left) control this and the three parallel jaw-clamping cylinders; three positions on each are for forward, neutral, and reverse. Fixture weighs 500 lb. Major savings are on pinrouter fixtures, labor



RACKING BARSTOCK on one bay of machines. Depending upon type of setup, loadings usually are made at the end of a shift

Job order system boosts

To obtain maximum productivity from a battery of automatic screw machines operating on fairly short runs, feed magazines are loaded each evening, and the foreman plans next-day runs according to job orders supplied by floor superintendent

Annual gross output of shafts for electronic volume controls and resistors has been boosted 33 1/3% by the Clarostat Manufacturing Co, Inc, through the systematic use of setup tools, well-laid-out barstock racks, and automatic screw machines fed continuously by air-operated bar feeds for periods up to eight hours.

At the company's Dover, N H, plant, screw-machine production is geared to meet particular customer job requirements. An average run is 10,000 parts, requiring setups to be changed three or four times daily. Quick setups and high-volume output must be maintained without jeopardizing adequate inspection.

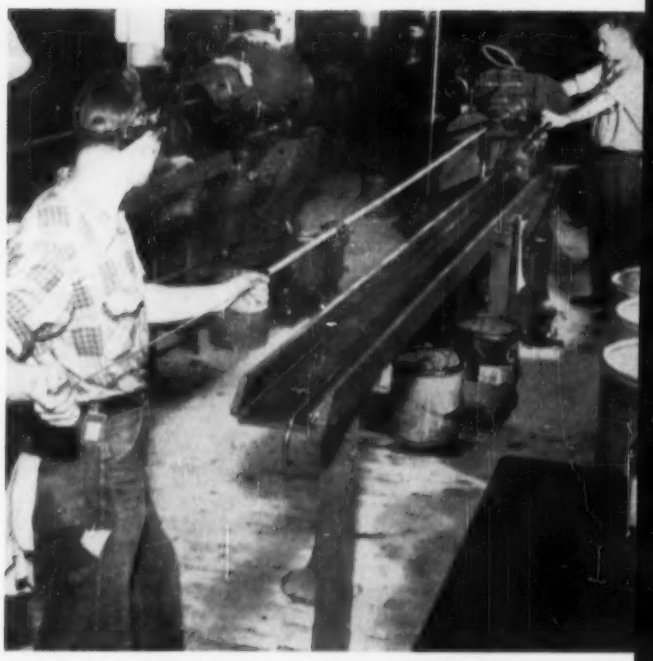
To achieve this efficiency, a six-man team services the screw-machine production area. It consists of a foreman, his assistant, three setup operators, and a stock boy. The area is subdivided into three work bays: a setup assembly and tool-storage crib, a stock bar storage bay, and the machine bay, where ten automatic screw machines—eight equipped with Lipe AML pneumatic bar feeds and two with feed fingers—machine aluminum, brass, or plastic shafts for electronic control devices.

At the end of the day, barstock for the Lipe-equipped screw machines is loaded for the next day's runs. At the same time, the foreman, or his assistant, plans the next day's setups, based on job orders from the floor superintendent. Job orders are ticketed to a board and numbered to denote the order in which jobs are to be run. Necessary setup tools for each job are placed in small tote boxes, also numbered to correspond with the ticketed job orders.

Because barstock and tubing is consumed at great rates (20,000 lb of brass rod, 2000 lb of brass tubing, and 5000 lb of aluminum rod per month), storage racks are located at opposite ends of each screw-machine bay, enabling the stock boy to load the magazines of the pneumatic bar feeds without interfering with the activities of the setup operators.

Besides increasing the annual over-all production of shafts by 33 1/3%, the job-order system at Clarostat, supported by the pneumatic bar feeds, reduced production and man-hour costs. Before these feeds

ASSISTANT FOREMAN jobs out the next day's setups. Plastic tote boxes, containing necessary tools, are ticketed to correspond with job order on nearby bulletin board. Each order is numbered to denote its production priority



MANUAL LOADING at Clarostat has been minimized. Feed fingers mar the bar stock, interfere with the attention an operator must give to his other screw machines

production

WALTER J. MUCHER, plant & production mgr,
CLAROSTAT MFG CO, INC, DOVER, N H

were introduced, nine men, including the foreman, were necessary to hand-feed the battery of ten automatics. Production, at that time, was 380 pieces (average length: 1⅛ to 2½ in.) per hr. After eight of the machines were equipped with bar feeds, production jumped to 500 per hr for the same size shafts. Also, the manpower necessary to service the ten units was cut to six men, three men having been reassigned to secondary machining operations.

While increasing production of parts per hr, the air-operated feeds decreased feed-cycle time by allowing longer lengths of stock to be fed in the same cycle interval. Formerly, using feed fingers, only 1 in. of stock could be fed in ¼ sec. With feeder, 3 in. of stock are fed in the same time. By making a minor adjustment to the screw machine, any length of stock can be fed. Through continuous loading, cutting air has been eliminated. Previously, to achieve high volume output with feed fingers, the operator had to be at the machine, ready to load a new bar at the time when the remnant must be removed. Morever, feed fingers and feed pads are unnecessary. Marred stock is no longer an inspection problem, requiring secondary grinding, and machine operators are left free to devote more attention to tooling, inspection, and maintenance.

Cut from 12-ft lengths of brass or aluminum stock, from 1⅛ to 0.251-in.-dia, the finished shafts vary in length from 1⅛ to 4 in. Machining operations vary from simple forming and cutting-off to burring, threading, chamfering, tapping and drilling.

Magazine capacity is from nineteen ⅝-in.-dia bars to ninety-six ⅛-in.-dia bars. Bar stock or tubing is racked in the magazine along one side of a split stock tube, the lower half of which slides backward to receive the bottom bar from the magazine. Carrying the bar, the lower half of the tube then returns to the closed position. A pneumatically activated stock pusher moves the bar into the spindle and collet of the screw machine, and then automatically re-engages the machine clutch.

Once loaded, the bar feed's action is completely automatic, feeding stock continuously. When the stock bar is used up to the end remnant, the machine clutch disengages and the cycle stops with the spindle revolving and the collet open, thus giving the stock pusher time to retract and pick up a new bar.

As a bar is released from the magazine and dropped into the lower half of the stock bar tube, the stock tube closes and another bar is in position to be loaded. The stock pusher picks up and feeds the new bar through the collet up to the cut-off stop, simultaneously ejecting the end remnant and re-engaging the machine clutch. After the new bar is positioned for the first cut-off, the collet grips the bar, and the machine is again in full-cycle operation.

14 steps TO DESIGN A DIE

STEP 2... How to design die blocks

J. R. PAQUIN

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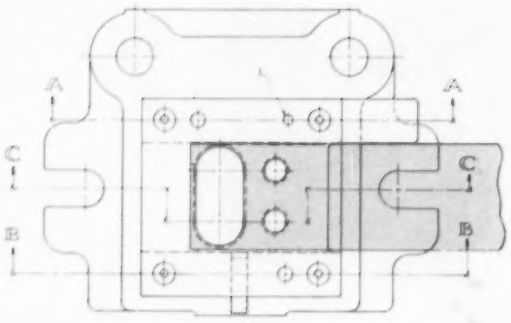
Four factors influence design of the die block for any particular die. They are:

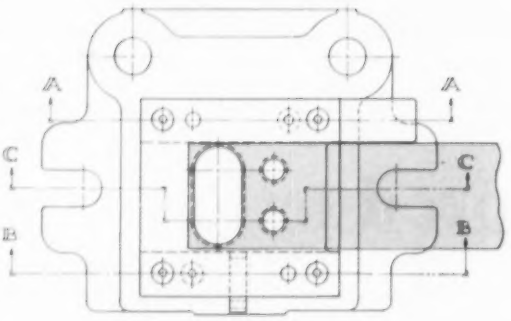
1. **Part size.**
2. **Part thickness.**
3. **Intricacy of part contour.**
4. **Type of die.**

Small dies, such as those for producing business-machine parts, usually have a solid die block. Only for very intricate part contours would the die block be sectioned to facilitate machining. Large die blocks are made in sections for easy machining, hardening, and grinding. Here are eighteen illustrated methods of applying die blocks to small, medium, and large cutting dies. These methods further explain Step 2 in the 6-page insert—"14 Steps to Design a Die" (AM—Oct, '55, p129)

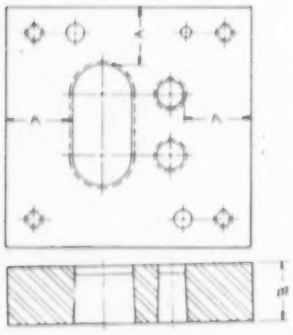


A Complete Die Member

1 • • Here is the best method of applying the die block to any small and medium-size die. Machined into the die block are the blanking opening C and piercing holes D. Holes E, at each corner are tapped completely through, and two dowel holes F are reamed, also completely through the block.

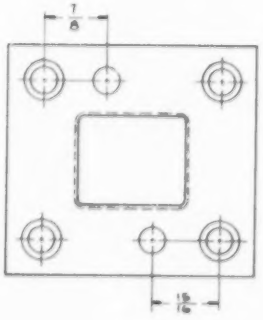


2 • • Because it conserves tool steel, this method of applying a die block is recommended when material shortages exist. Tool-steel die block A, made half the normal thickness, has a machine-steel spacer B under it. Two long socket capscrews C fasten the

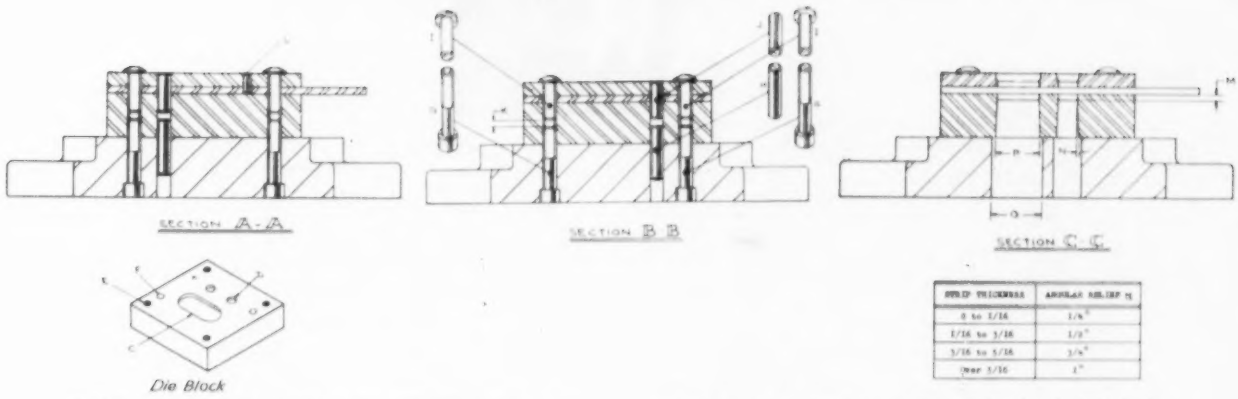


STRIP THICKNESS	DIE BLOCK HEIGHT B
0 to 1/16	15/16
1/16 to 3/16	1 1/8
3/16 to 1/4	1 5/8
Over 1/4	1 7/8

3 • • The minimum distance A from die hole to the outside edge of the die block is normally 1½ times the thickness of the die block B, but this would be increased to 1½ times die block thickness for larger dies, or where sharp corners exist in the die-hole contour. For very large dies and thick material strip, distance A might well be made twice the thickness of the die block. The table gives recommended die block heights for various strip thicknesses



4 • • Dies with symmetrical openings can be assembled incorrectly after repair. This occurrence can result in nicked cutting edges, because of slight mis-matching of punch and die members. Prevent this by "foolproofing" the die block. In dimensioning, place one of the dowels a different distance from its screw hole than the other



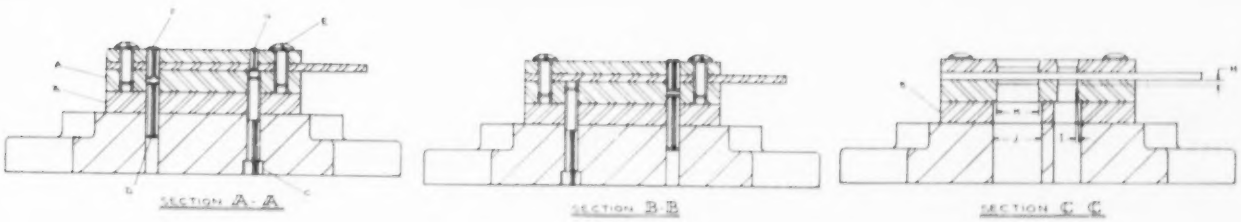
STRIP THICKNESS	ANGULAR RELIEF N
0 to 1/16	1/4°
1/16 to 3/16	1/2°
3/16 to 5/16	3/4°
Over 5/16	1°

Die Block

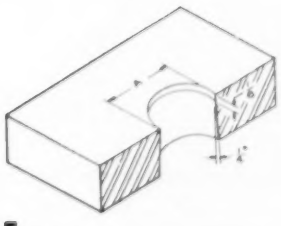
Section views A-A and B-B show the fastening method. Four socket capscrews G securely hold the die block to the die holder. Two dowels, pressed into the dieset and partly into the die block, prevent shifting. Four button-head socket screws I fasten the stripper plate and gages to the die block, while two dowels J maintain accurate positioning. Distance K, usually 1/4 in., is the grinding allowance.

A small dowel L (3/16-in.) locates the right-hand end of the back gage to the stripper plate. Other screws and dowels are never less than 5/16 in. dia for any die.

Section C-C shows the die hole, and the piercing-punch holes. Straight land M is 1/8 in. Angular relief N is tabulated. Hole O in the dieset is 1/8 in. larger than opening P in the die block, to provide 1/16 in. clearance per side



die block to the dieset, while two dowels D accurately locate it. Button-head socket screws E fasten the stripper plate to the die block, while dowels F and G are applied as in Fig. 1. Section view C-C shows the method of machining the die hole and piercing punch hole. Straight land H is made 1/8 in. Angular relief I follows the values given in the table in Fig 1. Slug clearance hole J, 1/8 in. larger than K, is carried through both the dieset and spacer B

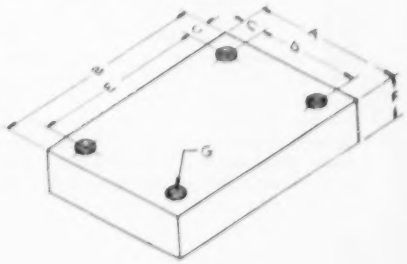


5 • • When close part tolerances are involved, you should know how much the blank or hole size will increase with die sharpening past the straight land. This table shows the growth for each 0.005 in. removed from the face of the die block when a 1/4° angular relief is applied. For 1/2° relief multiply the values given by 2. For 3/4° relief multiply by 3, and for 1° relief multiply by 4

Removed from face of die in sharpening	Blank opening A will increase by this amount
.005	.000043
.010	.000087
.015	.000130
.020	.000174
.025	.000218
.030	.000261
.035	.000305
.040	.000348
.045	.000392
.050	.000436
.055	.000479
.060	.000523
.065	.000566
.070	.000610
.075	.000654
.080	.000697
.085	.000741
.090	.000784
.095	.000828
.100	.000872
.105	.000915
.110	.000959
.115	.001002
.120	.001046
.125	.001090

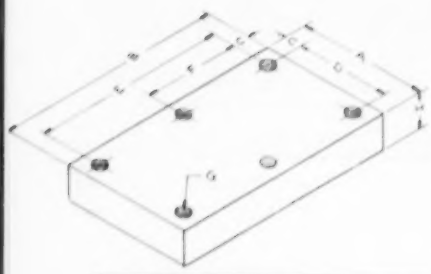
A	B	C	D	E	F	G
3	3 1/2	5/8	1 3/4	2 1/4	15/16	#I (.272) Drill, 5/16-24 Tap Thru
3	5	5/8	1 3/4	3 3/4	15/16	#I (.272) Drill, 5/16-24 Tap Thru
4	4	5/8	2 3/4	2 3/4	15/16	#I (.272) Drill, 5/16-24 Tap Thru
4	5	5/8	2 3/4	3 3/4	15/16	#I (.272) Drill, 5/16-24 Tap Thru
4	6	5/8	2 3/4	4 3/4	15/16	#Q (.332) Drill, 3/8-24 Tap Thru
5	5	3/4	3 1/2	3 1/2	15/16	#Q (.332) Drill, 3/8-24 Tap Thru
5	6	3/4	3 1/2	4 1/2	15/16	#Q (.332) Drill, 3/8-24 Tap Thru

6 • • Where large quantities of dies are produced, time and money can be saved by standardizing on die-block sizes, and assigning part numbers to them. These are for small dies

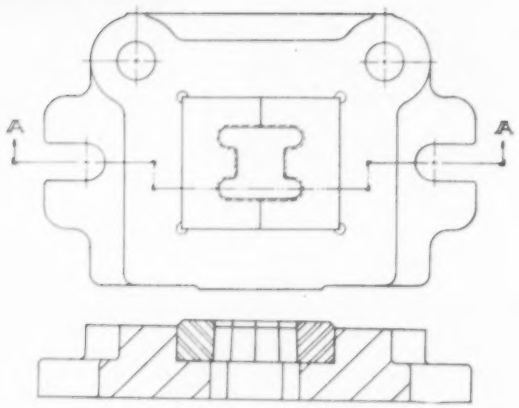


How to design die blocks

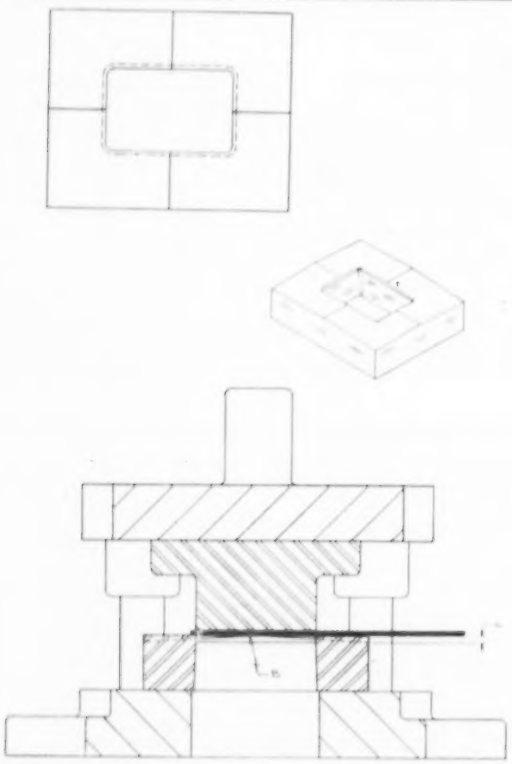
A	B	C	D	E	F	G	H
4	7	3/4	2 1/2	5 1/2	2 3/4	#9 (.332) Drill, 3/8-24 Tap Thru	1 1/8
4	8	3/4	2 1/2	6 1/2	3 1/4	#9 (.332) Drill, 3/8-24 Tap Thru	1 1/8
5	8	3/4	3 1/2	6 1/2	3 1/4	#9 (.332) Drill, 3/8-24 Tap Thru	1 1/8
5	10	3/4	3 1/2	8 1/2	4 1/4	#9 (.332) Drill, 3/8-24 Tap Thru	1 1/8
6	8	3/4	4 1/2	6 1/2	3 1/4	#9 (.332) Drill, 3/8-24 Tap Thru	1 1/8
6	10	3/4	4 1/2	8 1/2	4 1/4	#9 (.332) Drill, 3/8-24 Tap Thru	1 1/8
7	11	3/4	5 1/2	9 1/2	4 3/4	#9 (.332) Drill, 3/8-24 Tap Thru	1 1/8



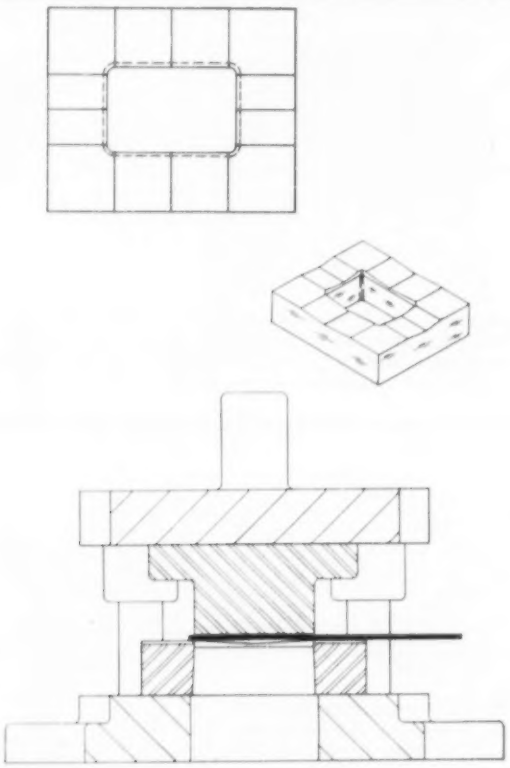
7 • • **Tabulated** are the most commonly used sizes of standard die blocks for medium-size dies. Tapped holes are National Fine thread, because they resist loosening under vibration far better than the coarse-thread series



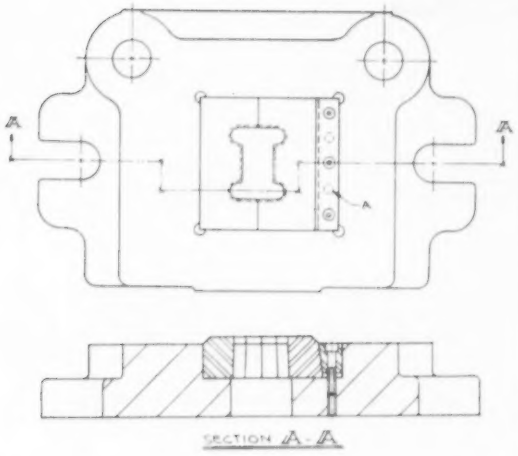
8 • • **When the die block is split for easier machining of the die opening, it is "set into" the die set. This view shows a split block, pressed into a recess machined in the die holder**



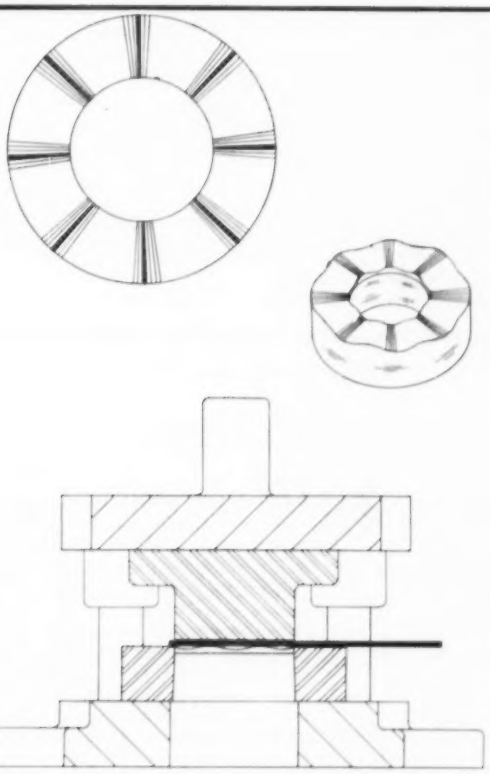
11 • • **For large blanks shear is applied to the face of the die to reduce shock on the press, the pressure required, and blanking noise. Shear, properly applied, reduces the blanking pressure by 25% for metals thicker than ¼ in. When thinner stock is blanked, the pressure reduction is as large as 33%. Shown above is the most common method of shearing the face of a large die block. Shear depth A is made 2/3 the thickness of the material strip. Radius B removes the sharp edge to avoid a focal point for stock fracture**



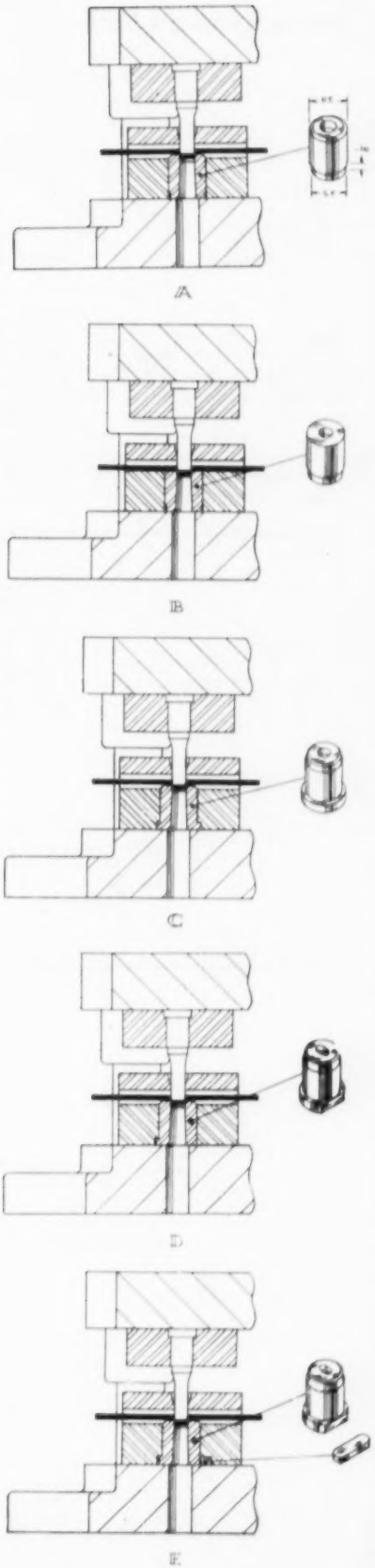
12 • • **This is a better method of providing angular shear. The material securely gripped at the corners between the punch and die members, is gradually cut toward the center. Shear is usually applied when blanks are larger than 5 x 5 in., and over 1/16 thick**



9 • • **A tapered wedge,** held down by socket-head cap-screws, is often used to clamp split die blocks set into die-set. Knockout pins can be inserted through the holes A for pressing out the wedge



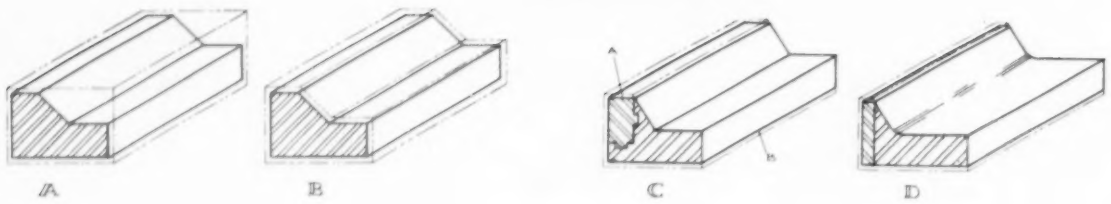
13 • • **Round die blocks** are given a shearing action by scalloping the face in a series of waves around the periphery. Here again, shear depth should not exceed 2/3 the thickness of the stock



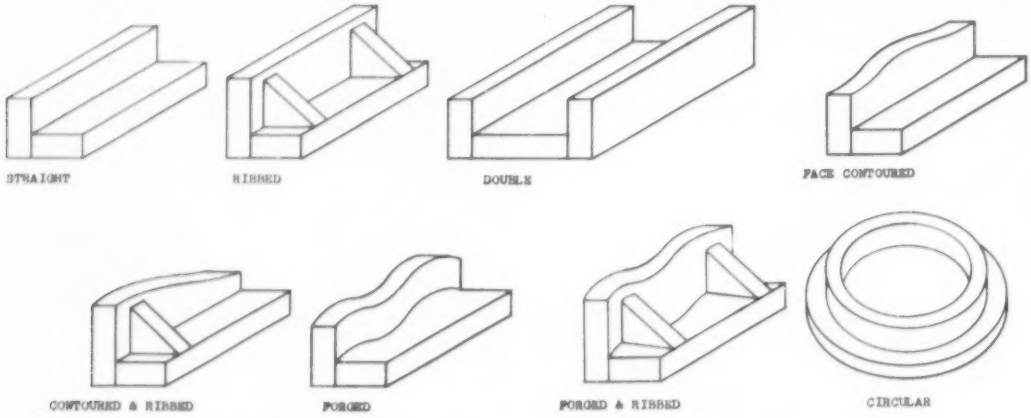
10 • • **Hardened die bushings,** held in machine-steel retainers, are commonly used in large die where piercing occurs. The straight press-fit bushing at *A* is the type most commonly used. With strippers, the top of the bushing is made flush with the face of its retainer, as shown at *B*. For heavy material strip the flanged type *C* is used to provide greater area against the dieset. It is also used when upward pressure would tend to work the bushing upward. Shown at *D*, a bushing with an irregular hole is kept from turning by a flat ground in the shoulder. This bears against a slot machined in the retainer. Where space is limited, die bushings can be kept from turning by a key bearing against a ground flat on the shoulder, as shown at *E*

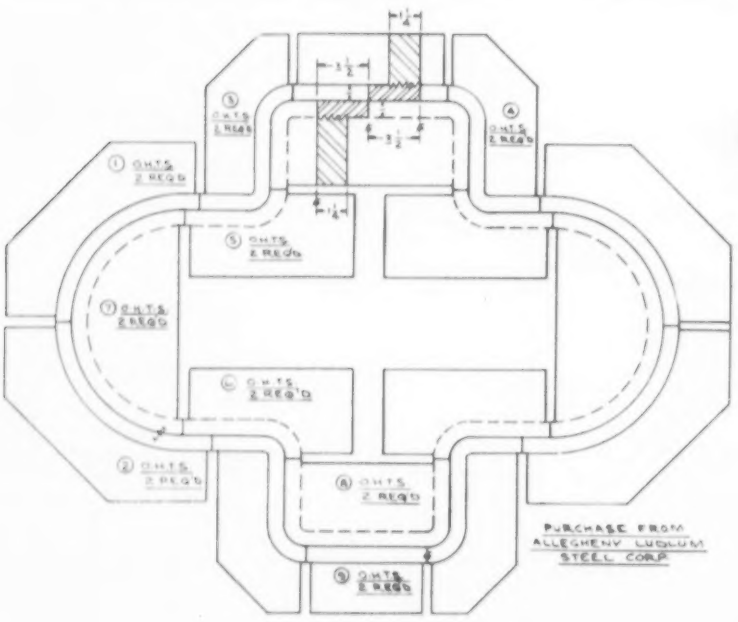
How to design die blocks

14 steps TO DESIGN A DIE

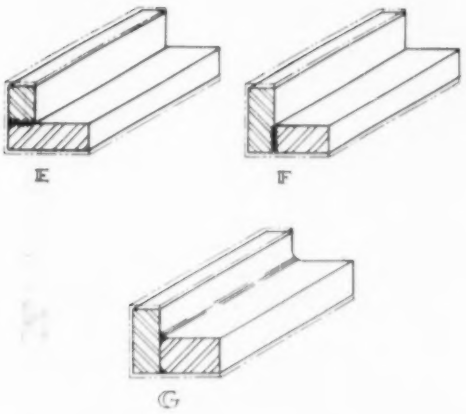


14 • • **Large die blocks** are made of sectional components, butting against each other. A number of types of these composite die sections are available. At *A* the section is machined from a rectangular bar of tool steel, and is obviously wasteful of material and labor. At *B* is illustrated Peninsular Rolled Stock, the original shape being denoted by phantom lines. At *C* is a Jessop Composite, which can be purchased in long bars and cut to required lengths. It can be forged to irregular contours without the tool steel member *A* breaking away from the soft machine-steel base *B*. At *D* the Richard Brothers Composite is shown. It is available only in straight lengths. At *E* an Ajax Composite section is shown, while at *F* is illustrated the Allegheny Ludlum Composite section. At *G* a Superior Composite section is shown. These composites all have a tool-steel cutting member electrically welded to a machine-steel base, which prevents excessive distortion in hardening, and provides a soft flange for easy machining for screws and dowels





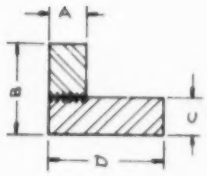
17 • • **After a large die** has been designed a composite layout is made on heavy paper or cardboard, exactly to scale. No dimensions are used. However, detail numbers, the type of tool steel, and the number of parts required are specified. Curved members are forged to this layout, allowing for machining. Note that joint lines for the tool steel faces are staggered, and never should come opposite each other. Only the tool steel members of the composites bear against each other at the ends to reduce fitting time



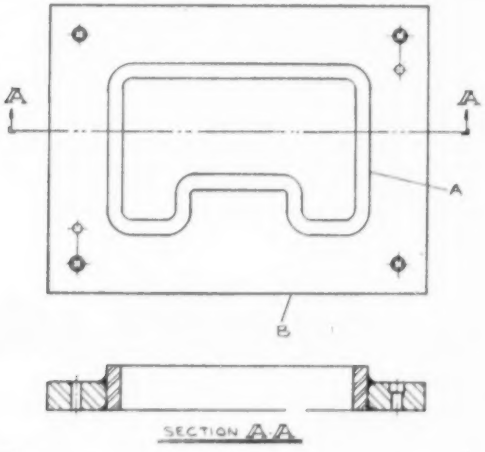
16 • • **Various arrangements** of composite sections can be supplied by manufacturers. It is obvious that almost any large blanking die can be fabricated from composite sections no matter how intricate the part contour

PROPORTIONS OF COMPOSITE DIE SECTIONS

STRIP THICKNESS	A	B	C	D	USE RIBS
0 to 3/64	1				
3/64 to 3/32	1 1/4				
3/32 to 9/64	1 1/2				
9/64 to 7/32	1 3/4				
7/32 to 5/16	2				
		2	1	3 min.	
		2 1/2	1	3 min.	
		3	1	3 min.	
		3 1/2	1 1/4	3 1/2 min.	•
		4	1 1/4	4 min.	•
		4 1/2	1 1/4	4 1/2 min.	•
		5	1 1/4	5 min.	•
		5 1/2	1 1/4	5 1/2 min.	•
		6	1 1/4	6 min.	•
		6 1/2	1 1/2	6 1/2 min.	•
		7	1 1/2	7 min.	•
		7 1/2	1 1/2	7 1/2 min.	•
		8	1 1/2	8 min.	•
		8 1/2	1 1/2	8 1/2 min.	•
		9	1 1/2	9 min.	•
		9 1/2	1 1/2	9 1/2 min.	•
		10	1 1/2	10 min.	•

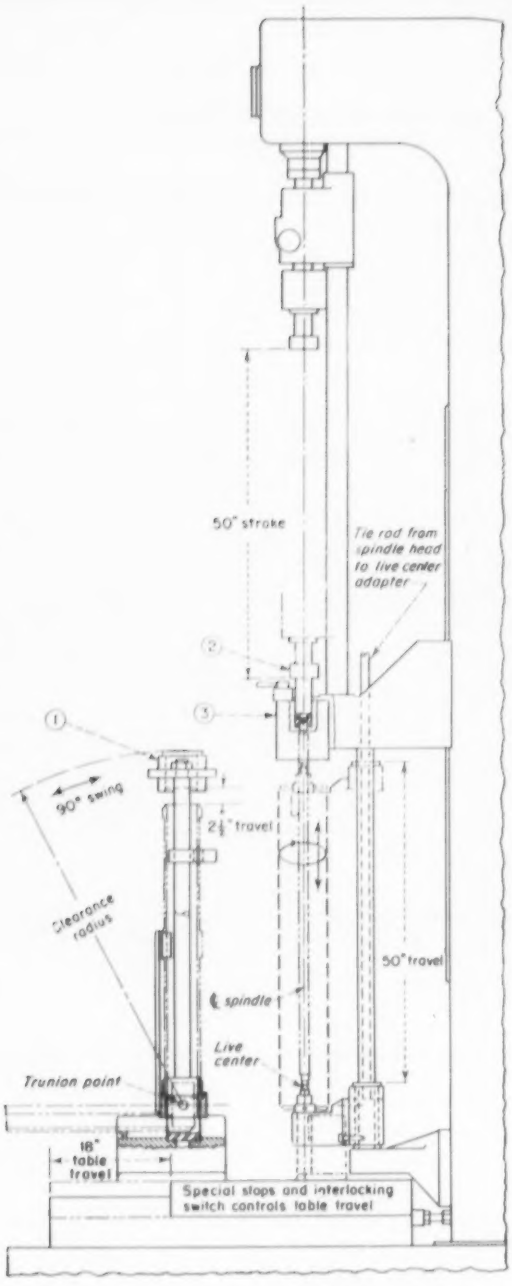


15 • • **This table shows** recommended proportions of composite die sections. Lengths of straight sections should not exceed 12 in. Curved sections should not be longer than 8 in.



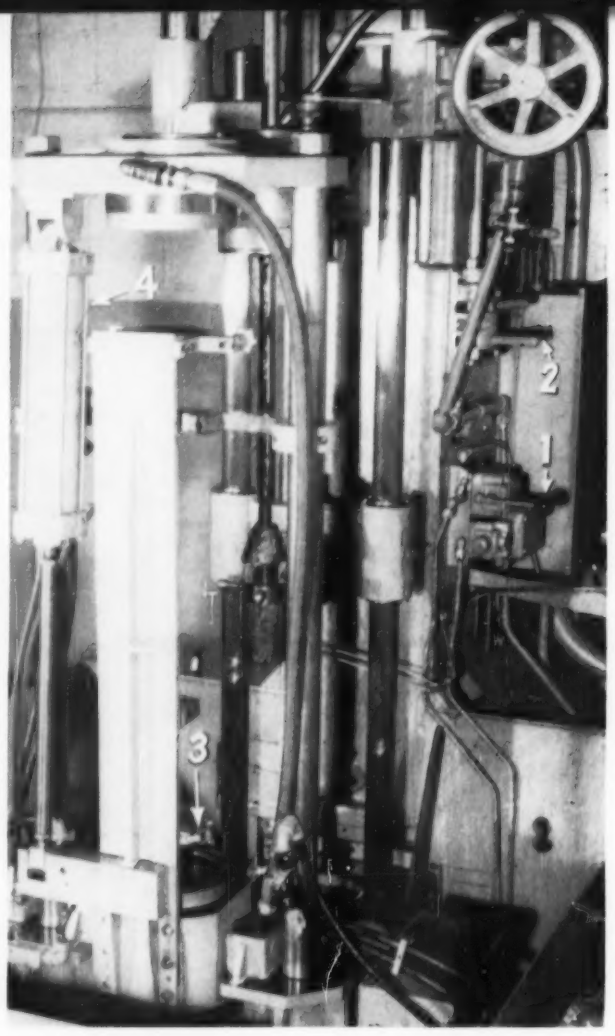
18 • • **Superior Composites,** shown at G in Fig. 14, are also used extensively for large solid die blocks. Here a solid tool-steel ring A is torch cut to the shape shown. A hole of the same outside contour is torch cut in the machine-steel base B to receive the tool-steel member. The tool-steel ring is welded in position and prevents excessive distortion in hardening

• This series will be continued in an early number



Tooling . . .

for honing external and internal parts of recoil mechanism included the semi-automatic trunnion fixture *1* for ID honing and the drive adapter 2 for OD honing piston rods on centers. Trunnion fixture, actuated by a manually controlled air cylinder, swings fixture through a 90° arc for loading and unloading recoil cylinders. Automatic hydraulic end clamping, adjustable up to 14,000 lb, is incorporated into fixture for holding work securely without distortion. End clamping pressure is slowly increased until torque, from cutting action of stones, is sufficiently overcome. Stone holder is removed from honing spindle and replaced with drive adapter to set up for external honing of piston rods. One end of work is keyed and pinned to adapter for rotation about dead center. Other end is mounted on adjustable live center secured to spindle head by a tie rod for reciprocal motion. Floating-stone holder *3* is mounted in a fixed position



Control lever *1* is manually operated . . .

for worktable travel of 18 in. to change from internal to external honing. Safety button 2 locks movement of worktable as a precaution against accidental tripping of control lever. Microswitch *3* prevents operation of machine until trunnion fixture is in a locked vertical position and end clamping applied. After stones have been collapsed and withdrawn at end of honing cycle, hydraulic end clamping is automatically released. Pushbutton on control panel actuates air cylinder *4* for lowering and raising fixture. Insistence on a vertical machine was based on the theory that the vertical honing tool is automatically self-centering, and that on verticals, bulky and weird-shaped parts can be more easily tooled and handled. Other advantages included gravity feed for coolant and elimination of sagging from workpiece

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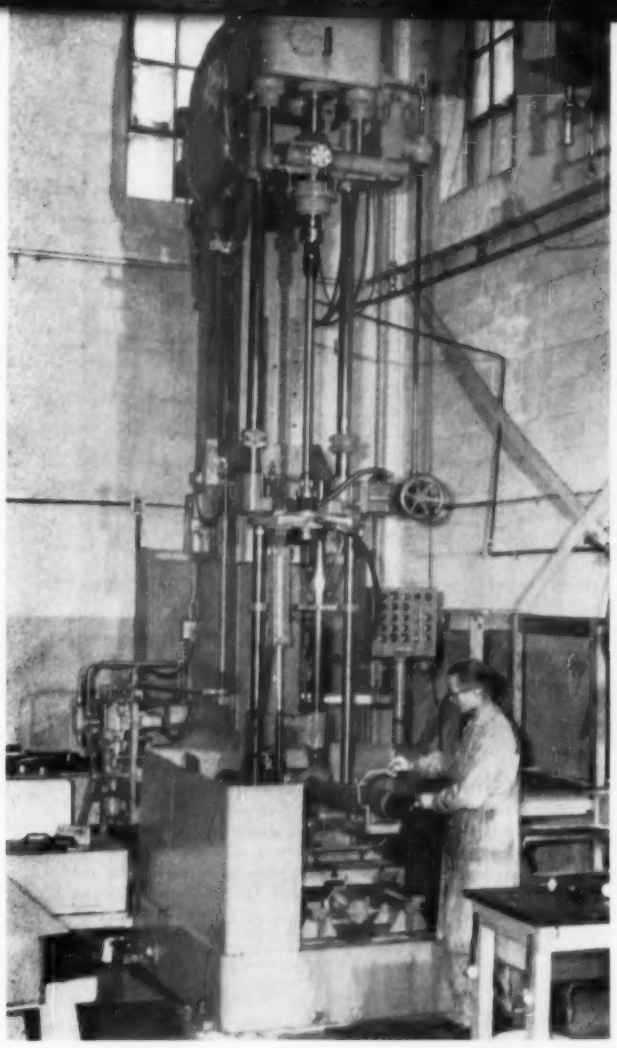


Recoil cylinder . . .

with a 2¾-in. ID, 45 in. long, was honed in four steps. Cylinder is a heat-treated 4140 R. 30-32 forging with a 3/16-in. (min) wall thickness. Forgings are first drilled and trepanned, then end flanges are turned and faced square for tooling purposes to nest in trunnion fixture. After honing, the OD is ground from the finished bore. Cylinders as received for honing have an average 0.010-in. taper, 0.008-in. out of roundness, and an average stock removal of 0.025 in. Rough cross-hatch honing with a 220-grit stone removes 0.014 in. of stock at rate of 0.001 ipm to a 32-mu-in., rms, finish. Semi-finish honing, 320-grit stone removes an additional 0.0065 in. at rate of 0.004 ipm to a 8-mu-in., rms, finish. Finish cross-hatch and draw honing, 500-grit stone removes final 0.0005 in. to an average 1.5-mu-in., rms, finish; average time 12.5 min. AMF engineers claim stock removal is considerably faster than grinding and slightly faster than boring

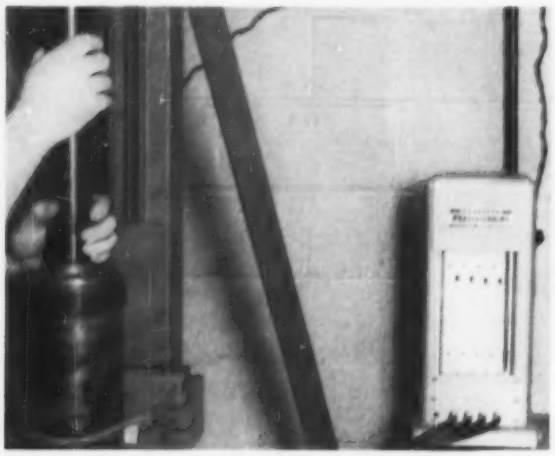
Air gaging . . .

was adapted to shop-built inspection fixture welded together from structural steel for checking ID of cylinder bores. Pulleys on top support and guide air lines, and phenolic collar on air-jet arbor prevents cocking when gaging bore. Gaging head has eight air jets which permit reading at points 45° apart as arbor, graduated in inches, is lowered through length of cylinder. Tolerances on cylinder bores and piston-rod diameter show 0.0002 in. on straightness, 0.0001 in. for roundness and well within ±0.001 in. on the mean diameter

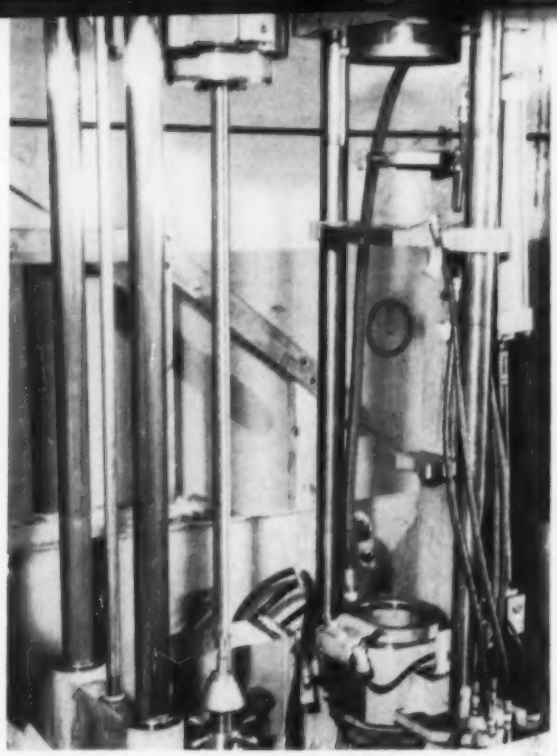
tooling idea . . . cinches shop problem

Manufacturing engineers at AMF were convinced that their shop could turn out a top-notch gun-recoil mechanism provided they could obtain a vertical honing machine with a minimum stroke of 51 in. capable of doing both external and internal draw finishing.

The machine, which incorporated special tooling for high production and semi-automatic operation of equipment, was built by Micromatic Hone. This vertical, with a 55-in. stroke, is tooled for a maximum work height of 72 in., for ID honing to 15-in. dia, and for OD honing parts 60 in. in length up to 6 in. dia. Here's how it was done

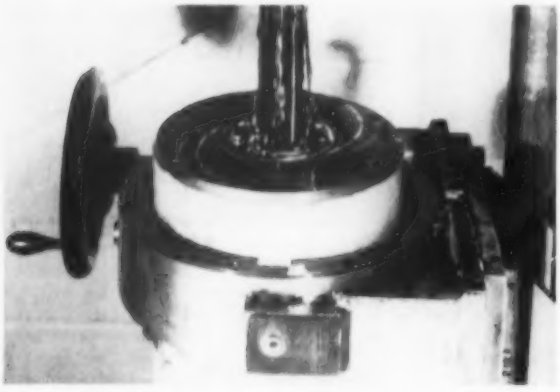


Checking floating-piston cylinder, which has a 4¾-in. ID, 46 in. long, is the largest part honed to date. Readings are taken at 1-in. increments. Cylinders are tested at 6000 psi, although functional requirements do not exceed 3000 psi. Exceptional high test is used to indicate whether cylinders remain within same tolerances before and after test. Any indication of distortion would reflect a defective forging or excessive clamping



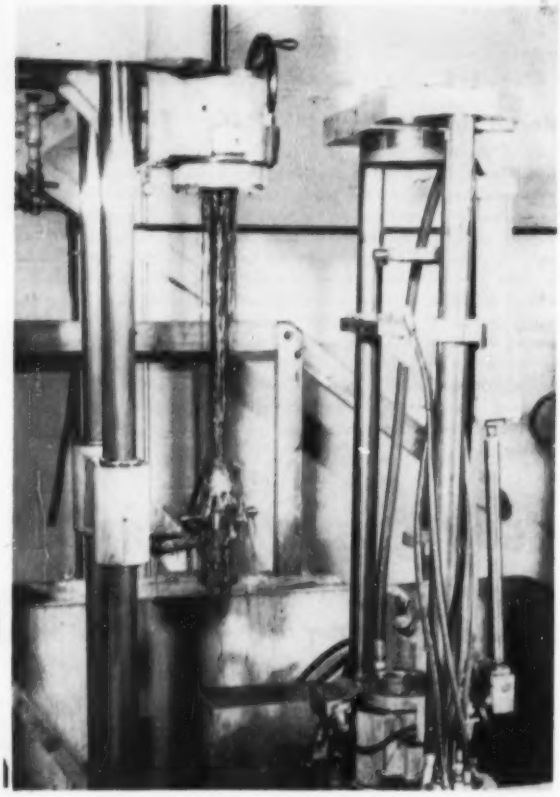
Trunnion fixture moved forward . . .

and tooling set up for honing 1⅞-in. OD of piston rod 56 in. long. Prior to honing, rod is rough turned and ground to a 16-mu-in., rms, finish, leaving 0.005 to 0.006 in. for stock removal. Rough and semi-finish honing removes 0.005 of stock in 20 min. Finish cross-hatch and draw honing take 15 minutes to bring rod into same tolerances and specifications as noted for cylinder.



External honing head . . .

floats in a trunnion fixture to provide uniform stone pressure on OD of piston rod. Handwheel in background is used for manual compensation of stone wear, and for manual feeding of stones when draw honing, because of minute amount of stock removal. However, collapse and feedout of stones are automatic, but manual feedout is advanced between each successive part to correct stone wear. Draw honing is controlled by an electrical mechanism and a timing switch for indexing the honing spindle at end of each stroke cycle. Degree of index spacing is adjustable up to 45°; on job above, indexing is held to 4°. Indexing takes place at bottom of each stroke in external honing, at top in internal honing



Reciprocating recoil-piston rod . . .

is shown on the semi-finish upstroke cycle through the stationary head which mounts the floating stone holder. Draw honing is advantageous on these parts because the surface-finish lines assume the direction of functional action between the piston, cylinder, piston rod and silver sealing rings. It was found that the draw finish minimized wear on the silver rings mounted on the piston and also on the liner in the piston-rod bearings. Changeover from external to internal set-up takes 1 hr and changing of stones between operations takes 12 min.

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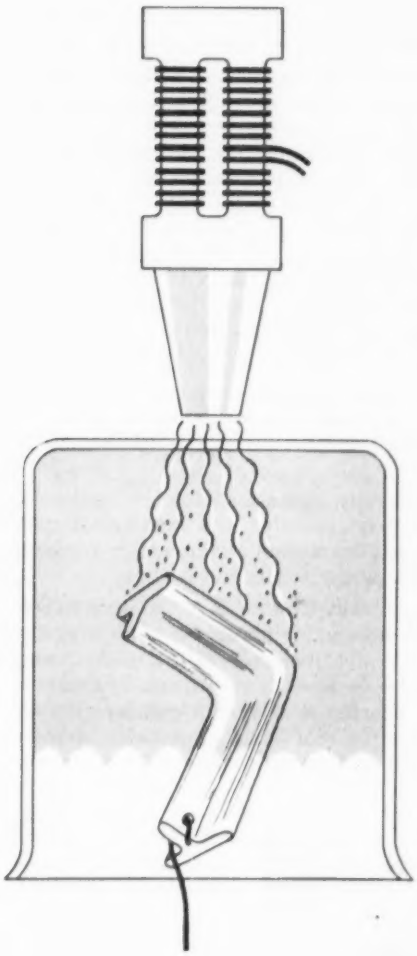

ULTRASONICS

how it works and what it does

ALEXANDER MURDOCH, JR, consulting engineer, PORT WASHINGTON, NY

The development and control of ultrasonic vibration has given Metalworking a new tool whose possible applications are, as yet, largely unexplored. Its largest field, at present, lies in cleaning, degasifying, and emulsifying, but it is also finding wide application in the field of inspection. The latter is a specialized development, not touched on in this report.

Metalworking executives who will have occasion to apply this new technique will find here the basic information on the underlying principles of operation, the types of equipment to select, and the power to use

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How ultrasonics works

Many of the unusual properties of ultrasonics have long been known but, with few exceptions, mainly in applications to underwater communications, sonar, and more recently, nondestructive testing of solids, work done in this field has been conducted in laboratories on a small scale. It has, however, served to establish that ultrasonic energy can be most useful and efficient in performing many tasks not readily accomplished in any other way. Recent developments indicate that it has many new and useful applications, and while the capacity of present commercial equipment is still relatively limited, the results that can be obtained are so spectacular that larger capacities are bound to be required.

Described here are some of the factors that must be considered in developing ultrasonic apparatus suitable for large-scale commercial application, as well as some of the results obtained with such apparatus on a production basis.

The basic components of the acoustic system comprise a tunable ultrasonic oscillator, a power amplifier, a transducer which converts the electrical energy into mechanical-acoustic energy, and a container for the liquid and other articles of interest. A power supply furnishes power to the oscillator and amplifier. In some instances, the liquid plays a significant part in the treatment—as with a solvent in a cleaning process—or it may actually be the substance operated upon—as in emulsification.

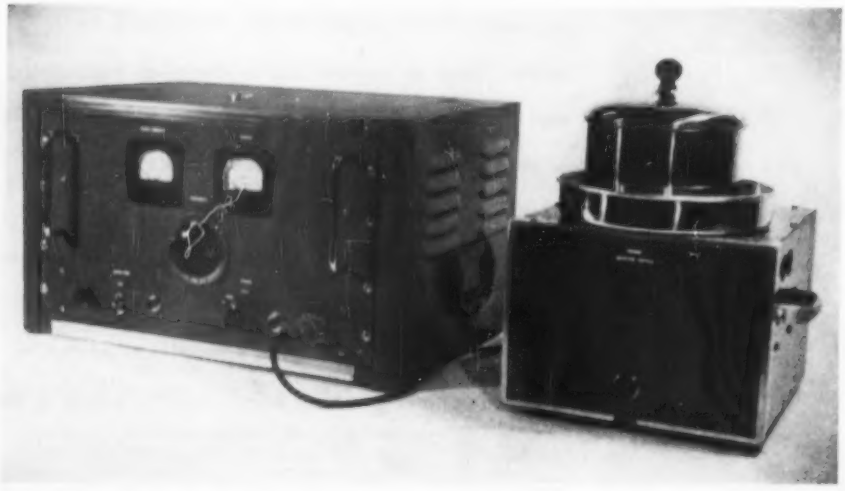
CAVITATION

If an elastic medium, such as a liquid, is subjected to alternating forces of sufficient magnitude, the liquid is literally pulled apart, and cavities or bubbles of vapor are formed. The collapse of these cavities produces extremely high transient forces. This collapse also generates broad-band sound of random frequencies, termed white noise, which is quite apart from the simple harmonic vibrations generally employed as the disturbing force. In some cases, sound below the cavitation level is desirable, but in others, the high forces liberated by cavitation greatly accelerate processes and are most desirable.

Because of its broad-band characteristic, the noise produced at cavitation is frequently audible as a hissing sound, and the cavitation bubbles are clearly visible.

It is generally understood that cavitation occurs when sound is generated in a liquid with sufficient intensity that the sound pressure is equal to or greater than the total pressure in the liquid.

It is important to note that the sound intensity and, consequently, the amount of energy required to cavitate a liquid, increases with the external pressure and decreases with an increase in temperature. Further, it varies widely with different liquids. As the temperature of a liquid subjected to sound pressure is increased, agitation appears to increase. The



Ultrasonic generators . . .

. . . vary considerably in design, depending on their use. This is a simple setup for cleaning small parts and is intended for bench use

cavitation bubbles grow in size and increase in distribution in a spectacular manner. This does not mean, however, that the sound intensity in the liquid increases.

In some processes, such as pickling steel, the rate of attack of the acid upon the metal is accelerated by raising the temperature of the pickling bath. If ultrasonic energy is added, still further acceleration is noted. However, as the increase of temperature reduces the effectiveness of the ultrasonic action while improving the acid attack, a compromise must be made. Where conditions warrant the added complication of pressurized containers, high ultrasonic energy levels are practicable in low-boiling-point liquids at high temperatures.

EFFECT OF FREQUENCY

Considerable controversy exists regarding the difference in the effects of ultrasonic energy at different frequencies. Because maximum sound output from a transducer is obtained at, or very near, its resonant frequency, and depends upon the physical size of the vibrating elements, considerable expense and difficulty would be involved in adequate measurements to yield accurate comparisons.

Under any circumstances, the attenuation of energy at high frequencies is a factor to be reckoned with. Therefore, in many applications it is preferable to use energy in the lower ultrasonic range. After several thousand tests, it can be conservatively stated that the frequencies just above audibility are most effective in cleaning, degassing and emulsification processes.

Some difference in effects noted with higher—and lower—frequency irradiation are interesting:

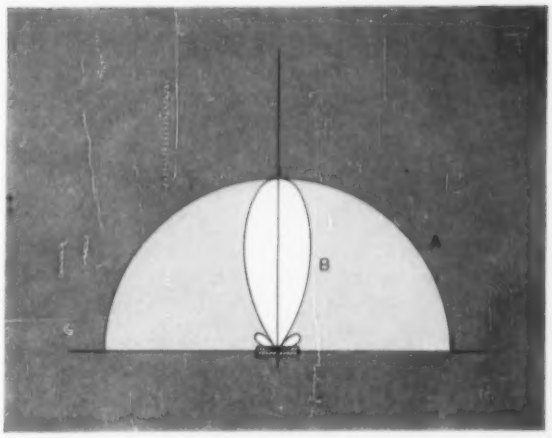
(a) Oil-and-water emulsions created by ultrasonic action without an emulsifier: After several years, those prepared with 8 to 20 kc/sec energy are quite homogeneous, while some made at 40 kc/sec are flocculent in apperance, although no agglomeration has been noted.

(b) Energy present in the liquid: With moderate power at 16 to 18 kc/sec, a tingling sensation is readily felt, and with higher power, a severe burning sensation; but high power at 200 to 400 kc/sec is not so detectable.

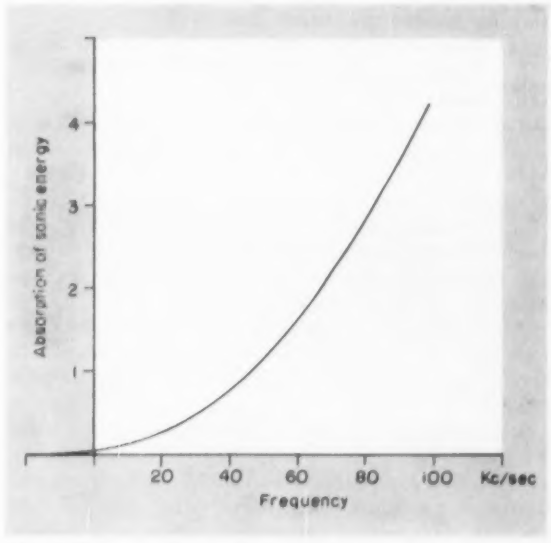
(c) Scrubbing or cleaning ability: These actions seem definitely superior at lower frequencies, although quantitative measurements are not available.

(d) High-intensity sound at frequencies below 20 kc/sec in a liquid will transmit kinetic energy to solid elastic particles: For example, when a test tube containing a few small steel balls is immersed n the liquid, the balls will bounce 3 to 5 in. vertically, depending upon the sound intensity. This effect disappears as the frequency is increased and is absent at frequencies at and above 200 kc/sec, even with high intensities.

(e) The ability of high-frequency sound to atomize liquids in a container decreases with the frequency: This is an important factor when flammable or toxic liquids are used as solvents. There is virtually no spray, consequently no serious fire or personnel problems in the use of the lower frequencies with commercial solvents.



Directivity of radiation...
... of sonic energy from the same sound source. A at 20 kilocycles per sec. B at 200 kilocycles per sec. Note that uniform distribution is obtainable at low frequencies, while a beam effect, or directivity, results from high frequency



Absorption of sonic energy...
... by a liquid varies as the frequency squared. High frequencies leave much less energy available for useful work in cleaning; additionally, much greater energy is required at high frequencies to produce cavitation

FREQUENCY PHENOMENA

Also well known are some other phenomena associated with frequency: Radiation of sound from a point source in an infinite medium is of equal intensity in all directions. If the source has finite dimensions, as with a diaphragm, piston, or surface, a sound beam is formed, the included angle of which is inversely proportional to the diameter or length of the source and to the frequency. In relatively small containers, the distribution is affected by re-

flections which may hinder or help obtain particular results. Where it is desired to obtain a beam of extremely high sound intensity, this is conveniently accomplished with a small radiator operating at high frequency. Similarly, radiators, or sections of cylinders and spheres, produce lines or points of high intensity; and, again, the higher the frequency the smaller the radiator needed to obtain the same degree of concentration.

The control of energy distribution is important. In many cases, sound beams or areas of high sound energy are extremely valuable. Such applications occur in brain surgery, flaw detection in metals, thickness gages, communications work, and in other functions.

However, for the processes with which this article is concerned, uniform distribution of intense acoustic energy throughout a region is necessary. Whether this region be small or large, the important factor is that the sound be evenly dispersed, rather than focused—a condition which limits effectiveness to the near field surrounding the focal point. For example, a volumetric process, such as cleaning, will lose its effectiveness if there should be shadowed or unexposed areas caused by focusing and reflection effects.

The interference or standing wave pattern caused by reflections from the walls of a container will tend to produce areas or layers of maximum and minimum cavitation throughout the liquid.

Transducer materials

In the selection of the operating frequency, much depends on the available materials capable of converting electrical to sound energy. These materials may be divided into three classes:

(1) Piezo-electric crystals—the best known being Rochelle salts, ammonium dihydrogen phosphate (ADP), and quartz.
(2) Polycrystalline titanates of barium—with and without additives for special effects.
(3) Magnetostrictive materials—nickel and its alloys (particularly 50-50 nickel-iron), Permendur, Alfer, and iron-cobalt alloys.

Each of these has properties differing from the others and making it suitable for certain applications and at particular frequencies.

In the effort to obtain high sound intensities over long periods, the stress limits which the materials can withstand without rupture or fatigue failure must be considered.

Experiments reported by W P Mason, US patent No. 2,514,080, have shown that ADP and quartz crystals rupture if stretched to 0.1% of their length, and the maximum particle velocity obtainable is less than 6% of the velocity of sound in air. From this and other sources, the ultimate strengths of the various transducer materials are listed in an accompanying table.

However, in the actual use of transducers, the fatigue limit of the material used is the limiting factor; this is, of course, lower than the tensile strength of the material.

MATERIAL	ULTIMATE STRENGTH (PSI)
Quartz	11,400
ADP	2,840
Titanates	6,000
Nickel (annealed)	70,000

Ultimate strengths . . .
. . . of various transducer materials give an idea of their suitability. Fatigue limit, however, is the controlling factor

ADP and Rochelle salts crystals are not usually used for ultrasonic power generation because of their low mechanical strengths, extreme hygroscopic properties, and relatively low Curie points (temperatures at which they no longer function as sound generators). The titanates have a Curie point of approximately 100 C. They require electrodeposited or foil electrodes which must be protected against erosion if high unit area sound output is desired. Means for maintaining electrostatic polarization and low operating temperatures are also necessary. On the other hand, it is possible to make a simply constructed, compact transducer with titanates. Difficulties are presently being encountered in manufacturing titanates in large sizes. Because size is the frequency-determining factor, the titanates are used principally for higher frequencies, as are quartz crystals, which are also available only in small sizes.

EXPERIENCE WITH NICKEL

For the lower frequencies, say 100,000 cycles or less, nickel offers many desirable characteristics. Unlimited transducer size and capacity are made feasible by the substantial fatigue strength and a high Curie point of 353 C. Therefore, nickel is considered the appropriate material for hard use when extremely high acoustic power is to be supplied for long periods. Size limitations are not encountered, so highly efficent operation at lower ultrasonic frequencies is assured.

In application of any material, dissipation of a portion of the input energy as heat must be expected. If this heat were not removed in high-level, continuous operation, the output of a nickel element would be only temporarily reduced, while a crystal or titanate element would be ruptured. The inherently superior heat conductivity of nickel obviously permits a more efficient cooling process, and its greater strength precludes damage from thermal stresses. It is important to note that a high sound-producing efficiency for a nickel element at high power levels depends upon adequate cooling.

Nickel is subject to eddy current and hysteresis

losses, which can be minimized by proper choice of alloy and biasing field; plus lamination of the active element. The moderate frequencies used contribute further to reduction of losses. The magnetic polarization desirable for best operation can be obtained conveniently from permanent magnets or superimposed dc.

SOUND IINTENSITY

Sound intensity is defined as the rate of flow of energy per unit area past any fixed plane normal to the direction of propagation. It is equal to the product of energy density and the velocity of propagation. Values ranging from 0.3 to 10 w per sq cm are frequently quoted as the intensity necessary to produce cavitation; the actual value as previously stated, depends upon temperature, external pressure, and the vapor pressure of the liquid, as well as the frequency if in the megacycle range.

The quantitative measurement of sound energy developed is difficult because sound monitors for measurement at such high levels are not readily available. Calorimetric means have been used, but separation of the heat generated by the transducer elements from the heat produced by sound absorption in the liquid considerably complicates matters.

An approximation method, which has served as a guide and may be considered reasonably indicative of results, involves measuring the electrical input to the transducer required for incipient cavitation and comparing this value with the total driving power available. By computing the sound needed for incipient cavitation under the particular conditions, an estimate of the total energy attainable may be obtained by extrapolation. With this as a basis of measurement it has been possible to show the production of an energy density 70 to 80 times that needed to produce cavitation.

Practical applications

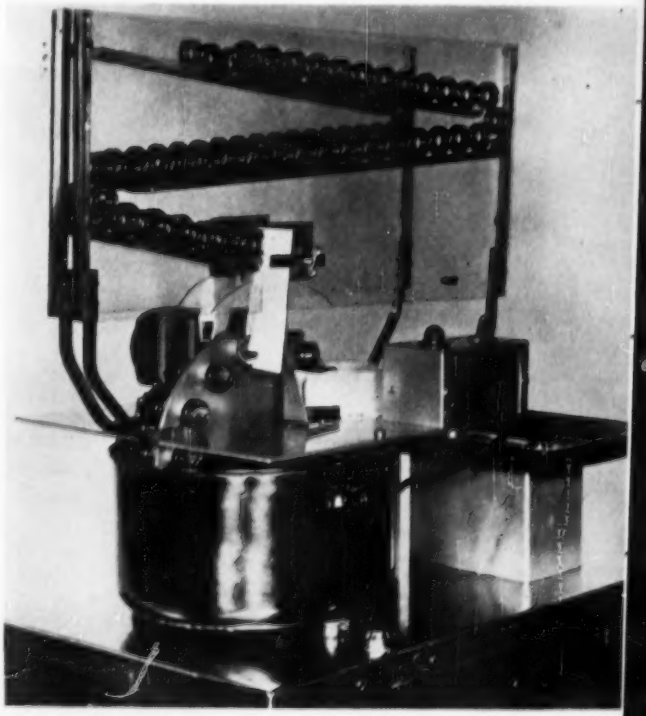
The removal of dissolved gases in aqueous solutions is readily accomplished with little sound energy at the lower frequencies.

Quantitative measurements were not made to determine whether all of the gases were removed, but it is quite possible to observe that dissolved gases are forced out of a liquid to a marked degree at a power level lower than that required for cavitation.

Removal of gases from electroplating solutions is a good application of ultrasonics; in addition, it is found that the application of ultrasonic energy at cavitation level to a copper cyanide plating solution permits plating without burning at approximately three times the maximum current density used commercially. The reason for this may lie in the continuous stirring of the cathode film.

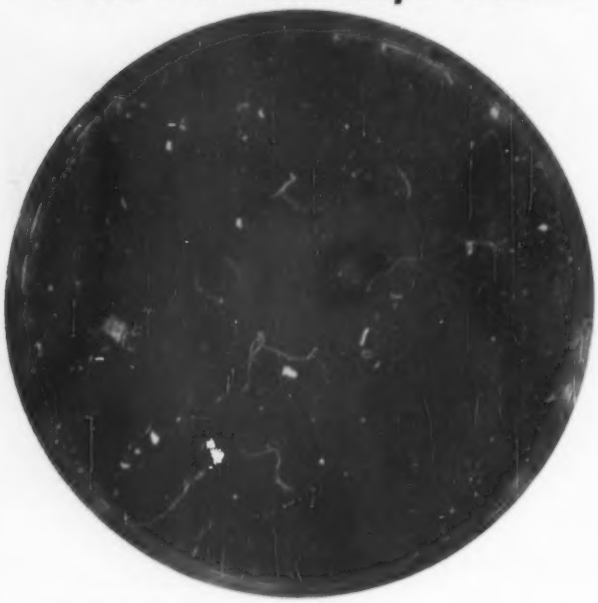
Removal of corrosion or heavy mill scale requires

Self-contained ultrasonic cleaner . . .
. . . has built-in container for the cleaning fluid and a constant circulation system with a filter capable of filtering to 2 microns. It is designed to be wheeled to any assembly location and to handle complete assemblies

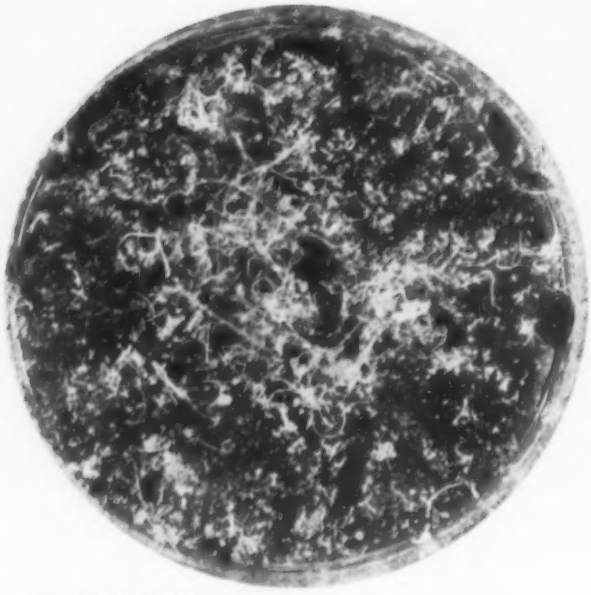


Production setup . . .
. . . for cleaning ball and roller bearings is fully automatic in operation. Two rows of bearings roll down chutes, load themselves onto pins on rotating plate which carries them through ultrasonic cleaning bath, then unload into discharge chute

What the microscope found . . .



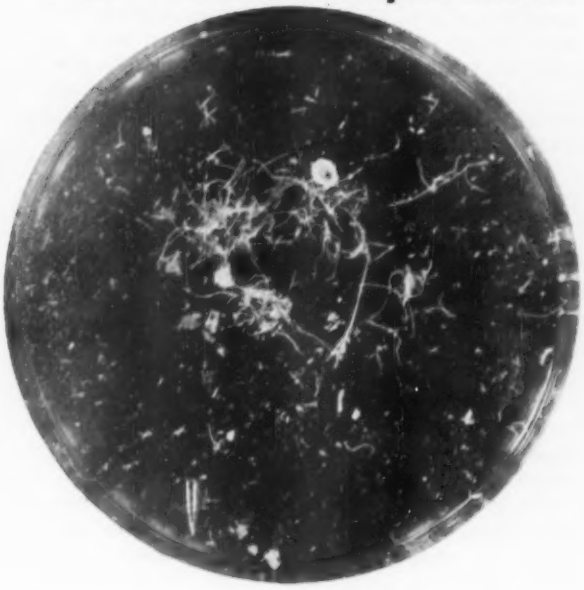
Foreign matter . . .
. . . removed from a ⅝-in. double-shielded ball bearing as received from bearing manufacturer. Particles shown are identified as organic fibrous materials and clusters of magnetic material



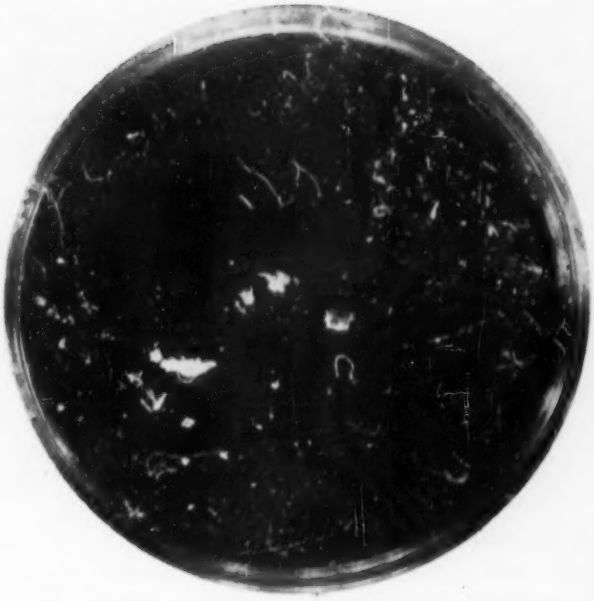
Double-shielded ball bearing . . .
. . . after removal from service because of contamination was found to contain this amount of foreign matter. Particles are copper, aluminum, and organic material. Magnification 10X

Particular advantage . . .
. . . of the ultrasonic process is that it permits cleaning a complete assembly, eliminating the problem of assembling scrupulously clean bearings in the relatively dusty atmosphere of the assembly floor

What the microscope found . . .



Bullet-Shaped particle . . .
. . . (lower center) was found in a ½-in. double-shielded bearing removed because of contamination. It was identified as solder and was big enough to render the bearing inoperative



Mixed metallic . . .
. . . and organic contaminants were found in this ½-in. double-shielded ball bearing after it had been in use a short time. Threads appear to be vegetable fiber of some kind

considerable ultrasonic energy. It has been noted, however, that the detergency effect of acids, phosphates, and other cleaners may be greatly enhanced by a short soak prior to applying the ultrasonic action. If this is done, the corrosion or scale is literally exploded from the work with considerable saving of process time and acid or detergent, and with consequently less erosion and pitting of the base metal.

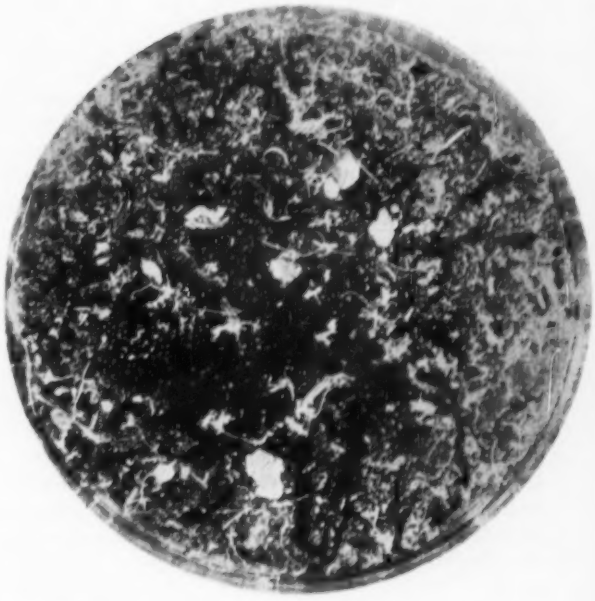
Similarly, the rapid removal of oxides and brazing flux, or the polishing of metal surfaces by ultrasonic action requires an energy level well above that required for cavitation.

In forming emulsions there are so many dependent and independent variables that any generalization regarding energy requirements would be almost meaningless.

A stable emulsion of gasoline and water, using a nascent amine soap and ultrasonics, was made by adding a small amount of oleic acid to the gasoline, and slightly more than the amount of ammonium hydroxide needed for saponification to the water. Various amounts of water, from 5 to 50% of the weight of gasoline, were emulsified in a comprehensive series of tests.

Variables encountered included the mineral content and Ph of the water, type of gasoline, rate of flow past ultrasonic agitator, sound energy, and temperature.

The emulsions were very stable in glass containers.



Massive amount . . .
. . . of organic and metallic material was removed from an unshielded ⅝-in. bearing. Some of the particles were not readily identifiable without chemical analysis

and microscopic examination revealed that the particle size was more uniform than that obtained with orifice homogenizers. It is interesting to note that some such emulsions would break almost immediately if stored in a galvanized container, perhaps because of the presence of metal ions.

Among the many things that ultrasonics can do, certainly cleaning is one of the more important. If "clean" is defined as free of soil or dirt, the process is close to perfection. For practical purposes, and in view of the lack of standards for the amount of soil that may be tolerated, some discussion of this subject will be in order.

In electroplating, painting, soldering, or welding and fusion of dissimilar metals, it is important to remove all possible soil to obtain satisfactory adhesion or bonding of the components.

In mechanical assemblies, requirements for improving reliability and accuracy are increasing to a point where the older, conventional means for cleaning are entirely inadequate. When it is realized that reliability and accuracy are directly dependent upon close tolerances and low friction, the need for cleanliness becomes apparent.

CLEANLINESS CONTROLS PERFORMANCE

With modern machine tools it is readily possible to control machine part tolerances in quantity production to insure clearances of not more than 0.0002 in. Ball bearings ground to the nearest 0.00001 in. are readily available. It is not difficult to imagine the result of even microscopic dirt on the operation of such components.

The Sperry Gyroscope Corp has recently perfected a testing instrument for ball bearings used in high-speed jet aircraft navigational instruments, guided missiles, bomb sights, and fire control and other computers. Bearings are rejected if their frictional torque exceeds 0.6 gram-cm while loaded with about 1 lb. Dirt particles visible only with a 20-power microscope have been proved to be quite sufficient to prevent such delicately adjusted equipment from passing its acceptance tests.

Until the advent of ultrasonic cleaning, pressure spraying with a petroleum solvent was the best available method of cleaning. Torque tests, however, indicated variable readings for the same bearing and it required 2 min per bearing for a cleaning that still left much to be desired. A low-frequency ultrasonic system has reduced this time by cleaning 10 bearings at a time in 1 min, and has reduced rejects to approximately 6 per 1000.

With slight or no modification the equipment has also cleaned a wide variety of other parts, some of which could be cleaned by no other means. They include guided missile hydraulic system components, servo motor laminations and commutators, fine-pitch screw threads, worms, screws and zero-backlash gears.

The results of over 10,000 tests have indicated that, with the proper solvent and with some ingenuity, almost anything can be cleaned with low-frequency ultrasonics.

These tests have led to some far reaching developments. At great expense, the environment of a ball-bearing test room is carefully controlled. Infiltration of dirt is avoided by pressurizing, dehumidification and dust filtering. Lint-free clothing, and oiled rubber mats at entrances provided with air locks are frequently used. But, unfortunately, production assembly areas are not so equipped. Consequently, recontamination at assembly is bound to occur.

As a ball bearing is, itself, an assembly, it was considered a possibility that complete assemblies and major subassemblies could be cleaned as units. The results far exceeded expectations, and large components are now being cleaned without any disassembly whatsoever, and much larger equipment for accomplishing this is being considered. The scouring action of the sonic energy penetrates blind holes and all types of crevices and corners in all directions.

Important points are that the solvent or detergent used must enter the space to be cleaned, must be removed when contaminated, and replaced by clean solvent.

Continuous circulation of solvent through two-stage filters was provided. To insure maximum sonic effect, the solvent was cooled by including a heat exchanger in the circulating system. Because many types of machining operations, including grinding, are involved in these assemblies, it was assumed that the particles to be removed would be largely ferrous and abrasive grit. This was only partly true, as it was found that an abundance of copper, brass, aluminum and organic fibrous materials was also present in considerable quantities.

OTHER USES

Low-frequency ultrasonics has also been found ideal for cleaning brass die-formed parts that were buffed to a high polish. It was necessary to remove all traces of buffing compound prior to lacquering, as small particles cause a substantial and undesirable build up of lacquer. Conventional vapor degreasers were found inadequate for this problem.

Watch parts involving blind holes filled with buffing compounds, the removal of which required 4 hr by existing methods, were cleaned to pass microscopic examination of 80 diameters in 4 min.

Other applications include the cleaning of badly oxidized stainless steel; glass ampules, lenses, and tubing; diamond dies for fine-wire drawing; and copper, beryllium bronze, and brass coils, springs, and stampings. High-pressure metallic hose of small ID, and coated with plastic, has been cleaned successfully of foreign matter, oxides, and fluxes.

There is yet much experiment and research to be done in this field particularly in the development of large-size, reasonably priced transducers and related equipment. But the preliminary work has already been done; it is only a matter of time and patience until the application becomes completely conventional in the fields to which it is so well suited. Successful completion of this task lies in close cooperation of both mechanical and electrical engineering fields.

Round Table

Caught in a Box

"Listen to this letter, Ed. I got it from Hadley, who works over in Milltown. He's explaining why he didn't take that promotion he mentioned last time we went hunting:

'They offered me that promotion to Department 72, like I told you they would, but I finally turned it down. They've had three foremen in there in the last five years, and not one of them could raise production.

'Of course I didn't tell the boss *why* I wouldn't take on the job. What I told him was that I was happy as group leader in the machining section, and didn't want a lot of extra grief. But actually the thing that bothered me was the short life each of those foremen had. Every one of them is now pushed out somewhere in a corner; not one of them has much of a chance of ever being a foreman of a real working department now.

'Galivan was the last guy to go, and the one who's place I'd have taken if I'd accepted. He tried hard to get things straightened out. I know because I've had my eye on that job for some time. But the supervisor and the plant superintendent wouldn't let him do anything that would have made a difference. The supervisor is the troublemaker. He wants to put in new methods to impress the brass, and to get production back up to snuff. But the guy who takes the foreman's job has to be a yes man. I can see how to improve production. Some of Galivan's original ideas were good, but he never got a decent chance to try them out. And I have some ideas of my own. But sure as hell the supervisor will knock them down, if I try, and make me do what he wants. And his ideas are no good.

'Even the old timers in the department know what's wrong, but they can't do anything. If the supervisor would give me a go-ahead to do what I want, I'd take the job like a shot. But there's no percentage in starting something you know is going to end up in the scrap heap.

'The trouble is, if I turn down the chance, I'll probably be put on some kind of company stinker list, and they'll never give me another chance at a foreman's rating. But I can't see being a yes man and doing what they want; and knowing damned well it won't work and they'll blame me for it. That's what happened to Galivan, and he's done for now. Anyhow, I told them no, so keep an eye open for a job for me at your place.' "

"That's some letter, Al. I wonder if he did the best thing."

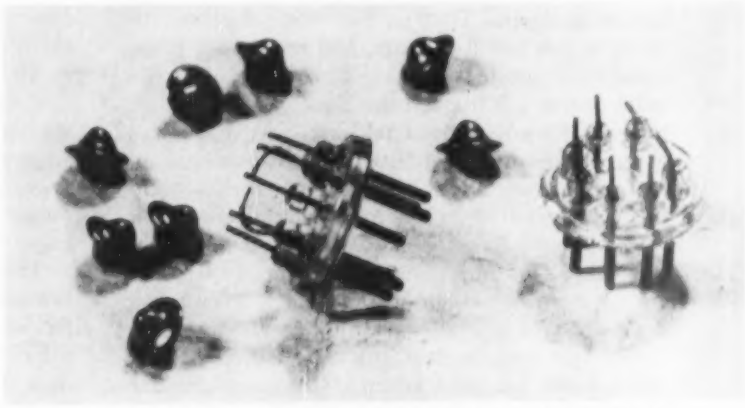
How about it; what would YOU have done? Was Hadley smart to steer away from this bum deal, or is he in worse trouble for refusing the promotion? Your opinions may help others in similar spots. Discussions of earlier topics start on page 148.

Steel cushions glass for a tough silver-plating job

The best way to silver-plate these nickel contact pins embedded in glass radio-tube bases is to tumble them in a bath; but the glass was a problem because of its fragility. Suprisingly enough, hard steel solved the problem, in the form of rounded buttons (Balcones), which were added to the tumbling charge. Their rounded shape prevents impact shock, and protects the glass from damage

RALPH ENYEDY, Electronic Tube Div.
WESTINGHOUSE ELECTRIC CORP.
ELMIRA, NY

PLATING BARREL IS LUCITE, 12 in. long, and 6 in. across hex flats. A full charge consists of about 100 tube bases in four layers, interspersed with about 1½ qt of Balcones. By the time the tumbling cycle is complete, bases and Balcones have shifted to become completely mixed



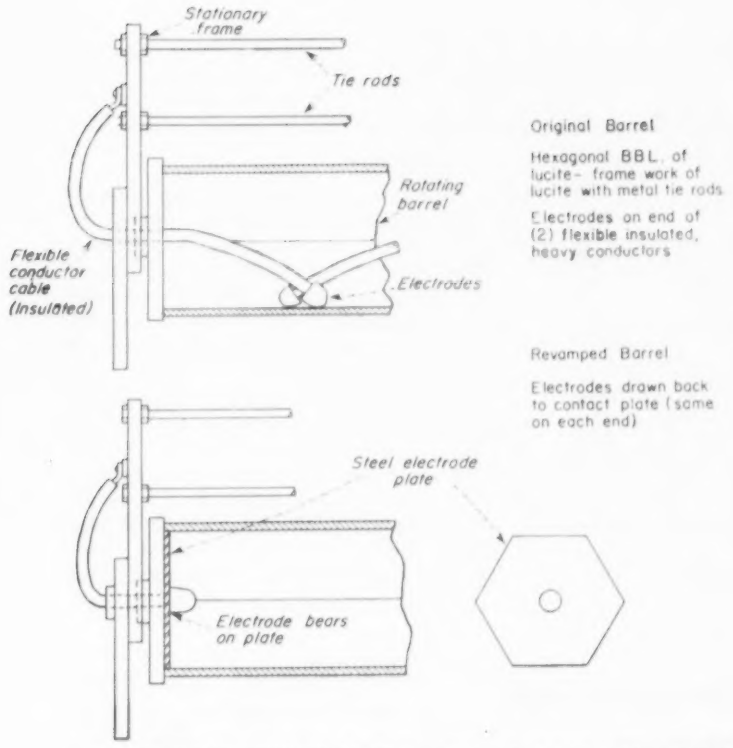
TUBE STEMS (OR BASES) ARE GLASS DISKS with seven leads through them. Outside ends fit into tube socket, after tube is assembled, and are 0.040 in. thick. Inner ends are 0.020 in. thick, and will support elements of the tubes—type 6AF4

There are easier ways to try to plate nickel tube pins than by tumbling; but bulk immersion produced a poor plate, and racking the parts in a bath would have been too expensive. The tumbling system worked best by far (see table, p107).

One further difficulty with racking the parts in an immersion bath was that the nickel leads would touch the rack, and at these points no plating would be deposited. Tumbling eliminated the problem because the steel Balcones, which are about 3/16 in. in dia, act as moving electrical conductors. Plating is quite uniform as a result.

Stems and Balcones are separated when the tumbled load is dumped into a water tank with double screens. One catches the stems as they drift down, but passes the Balcones. The second screen traps the steel buttons.

The Balcones get plated, too, and are deplated after about 50 cycles; and used again. All baths are at room temperature, and are vented carefully.


Stationary frame
Tie rods
Rotating barrel
Flexible conductor cable (Insulated)
Electrodes
Original Barrel
Hexagonal BBL. of lucite- frame work of lucite with metal tie rods
Electrodes on end of (2) flexible insulated, heavy conductors
Revamped Barrel
Electrodes drawn back to contact plate (same on each end)
Steel electrode plate
Electrode bears on plate

CONVERTED PLASTIC TUMBLING BARREL has shortened electrode cables attached to 0.060-in. hex steel plates at each end. Small electric motor mounted over barrel drives it at 4½ rpm in strike, plate, and rinse baths

Plating Operations:

1 **Etch in 50-50 nitric and acetic acid for 1 min, holding stems in basket**
2 **Rinse twice in deionized water**
3 **Load in plating barrel with Balcones; four layers of 25 stems each, with Balcones spaced between**
4 **Roll in silver-strike bath for 1 min at 8v. Bath is 5-10 gm/liter silver cyanide, 50-60 gm/l sodium carbonate**
5 **Roll in silver-plate bath for 8 min at 3 v. Bath is 19-25 gm/l silver cyanide, 25-30 gm/l sodium cyanide, 15 gm/l sodium carbonate**
6. **Roll in deionized water rinse, then discharge from barrel**

Reasons Why Incentives Do Work

VIRGIL H ROTROFF, general partner, GEORGE H ELLIOT & CO

Some incentive plans work, others don't. Yet the idea is sound. Most often the reason for failure is bad theory. If a company management should offer an incentive plan instead of a general wage increase, both management and employees are apt to blame the incentive plan when it fails to satisfy.

There are two sides to every question, and a good incentive plan, properly applied, has two sets of advantages; one set for management, and one for the workers.

MANAGEMENT'S GAIN

First, management can get increased production. It has been fairly well proven that an incentive plan will boost output, providing there actually are real incentives present. The one that works is the one that lets production workers increase their incomes.

Second, management can obtain reduced operating costs. The usual industrial arrangement is this: Management wants to buy productive effort, but Labor wants to sell working time. This is often a loose arrangement, but it can be tightened up by good incentives. The main point is in reducing wasted time that need not be lost.

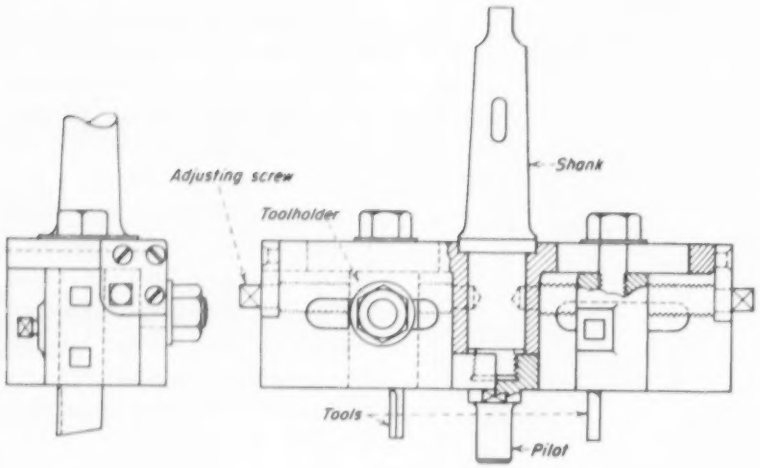
LABOR'S GAINS

Workers judge an incentive system largely by the amount of bonus earned. If the percentage gained is too small, the incentive will fail. Our experience indicates that 25% bonus is most efficient—it allows taking the maximum advantage from an incentive system. A lower bonus isn't interesting enough to the workers, and a higher one means the base pay must be low, and that provides too little protection for the workers.

If the incentive is on an individual basis, or for a small group, the worker sees that his effort really counts toward increased income.

(From an address before Society for the Advancement of Management)

Practical Ideas . . .



Heavy-Duty Boring (and Trepanning) Tool for 3½- to 10-in. Diameters

Shown here is a tough, heavy boring tool which can make holes from 3½ to 10 in. in diameter. Among its features are:

The Morse taper shank is renewable.

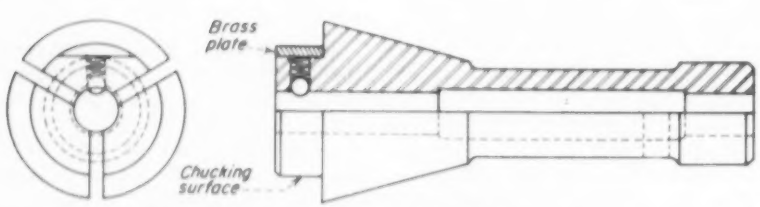
Toolholders are movable, capable of easy and fine adjustments to sizes by means of the adjusting screw on the side of the holder.

Holders are very rigid, with the body of the tool fastened by a stud and nut on one end, a setscrew on the other. Adjusting screw prevents slipping.

Rigidity of the toolbit is attained through three clamping screws.

Rectangular toolbits afford the maximum resistance to bending during cutting. The upper end of the toolbit fits the rectangular opening in the holder while the lower end is ground with rake and clearances.

A nut fastens the shank to the holder, and a pilot (the other end of the nut) guides the tool. A hole is drilled in the body and bearing pressure is provided by the retaining plate, which is held by screws which have their outer ends squared off for a wrench. *A G Amos, Jamshedpur, India*



Simple Spring-Collet Modification

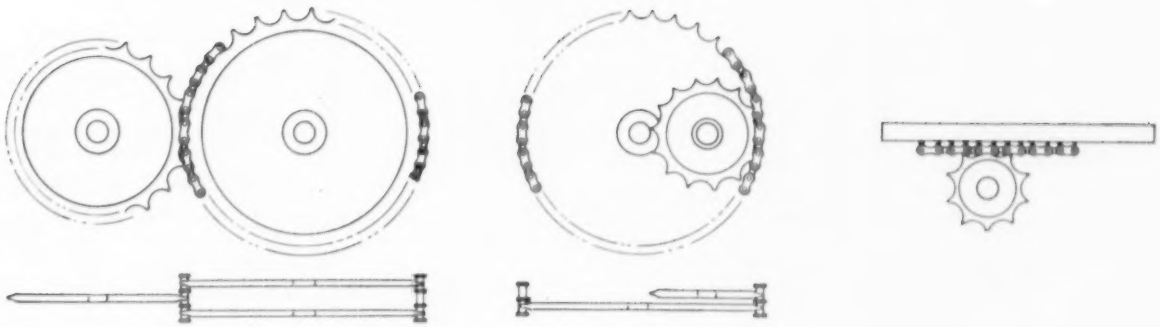
When a short end of stock is left inside the spindle of an automatic screw machine, it often rattles around, causing minor damage to the spindle, which may eventually interfere with stock feeding. To keep the stock in place until the next stock bar can be loaded to push it through, this spring-loaded ball mechanism can be added to the collet.

First, mill off a flat on the chucking shoulder of the collet. Then drill a hole perpendicular to the flat, breaking into the collet bore, but leaving a lip that will retain the steel ball. At most, the ball should project about a third of its diameter through the hole.

A small compression spring is mounted behind the ball, and a brass plate soldered over the hole (and spring) to cover it. Actually, a small plate might be machined to size, including the diameter of the collet. Then small screws could be used for assembly, to permit replacing the ball or spring.

The ball will not interfere with stock motion when the feed-tube fingers are working, but it will catch a short piece of stock and keep it from tumbling back into the recessed portion inside the spindle. It will also keep the stock in line to be pushed out easily by the next length of bar stock being fed through.

The ball, in our shop, has to be replaced about every three weeks, because it is subject to considerable friction. *W M Halliday, Southport, England*



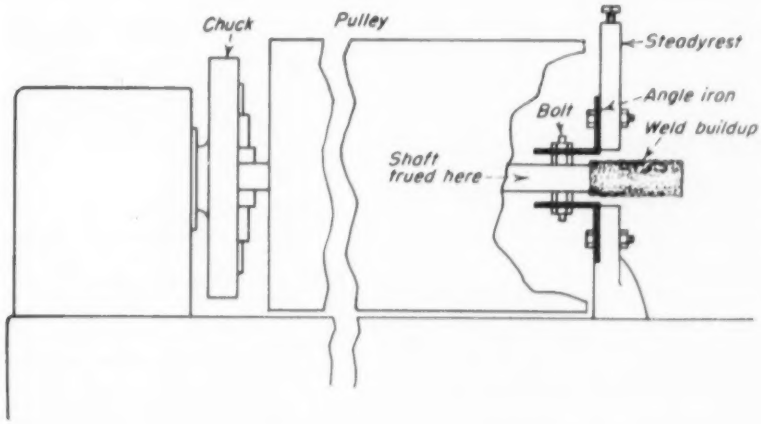
Low-Cost Gearing Made From Chains and Sprockets

When accurate transmission of movements is not too critical in gearing mechanisms, the devices shown here are sometimes cheaper and easier to construct than conventional methods would permit. Chains and sprockets, the main parts of the drives, are readily available at low prices.

The first sketch shows gear-pinion transmission, using a double sprocket, a single sprocket, and single and triple chains. To drive a similar system, but with an internal gear, a double chain is used, with the small gear riding in one of the tracks, the large gear in the other.

The third sketch shows a rack and pinion arrangement in which the rack consists of a piece of chain welded to a block, and the pinion is a simple, small sprocket.

Any of these devices can be built in a very short time, and, because the sizes and strengths of the parts are known, there is no need for complicated calculations and drawings. *Tsugunosuke Kikuchi, Osaka-fu, Japan*



Angle Iron Helps Center Shaft

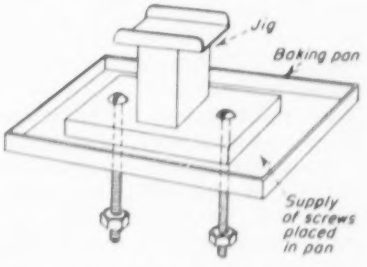
We had to center a conveyor shaft on a pulley 4 ft long and 16 in. in diameter. The shaft had been built up on both ends with welding material. We could not get the steady-rest on the true part of the shaft, because the cleaned up portion was inside the rim of the pulley.

To get around the trouble, we cut 3 pieces of angle iron and bolted them to the steadyrest jaws. Then we put 2 bolts in the end of the angles next to the finished part of the shaft. Thus the shaft could run on the trued-up section, while we spotted and drilled a center in the end of the work. *Harold Baird, Windsor, NS, Canada*

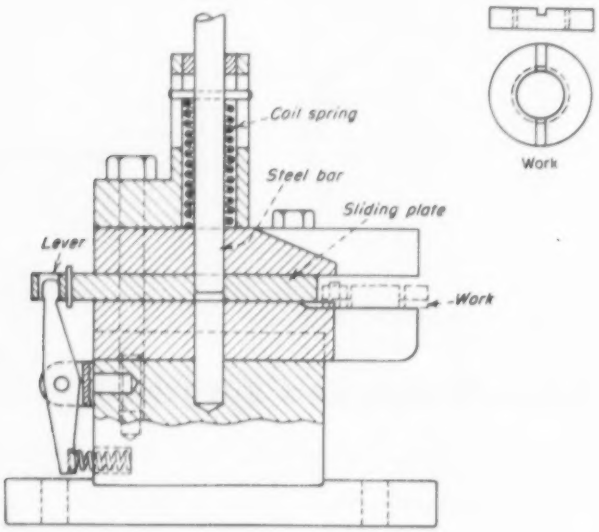
Pan Catches Falling Screws

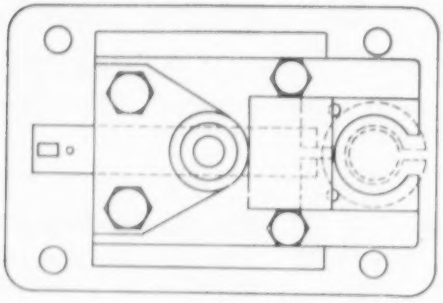
When inserting ⅛-in.-long screws into metal parts, using an air-operated screwdriver, we had trouble with falling screws. The parts were passing by on a running conveyor, and occasionally the pan holding the screws would fall off the bench. Also, many screws would drop onto floor or conveyor.

We solved this by mounting the



assembly jigs in 1-in.-deep baking pans, which would not only catch falling screws, but would also keep an adequate supply of screws for the day's production. *Fred Lettino, Astoria, LI, NY*





Sliding Plate And Steel Rod Aid Threading of Thin Washers

It often happens that thin nuts are pierced and blanked out from thin sheet metal, and the pieces must be threaded in a separate operation using a threading tool. Shown here is a threading fixture with an automatic knockout.

The nut is put on the table and a sliding plate with a slot milled in it prevents the nut from turning during the threading operation. The nut is pushed to the left, and the sliding plate follows. When the drillpress spindle descends, it also pushes the steel rod downward, so that the rod enters the hole in the plate and holds it during the threading operation. When the operation is done, the tap returns upward, and the steel bar also moves up under the pressure of a coil spring.

As soon as the steel rod leaves the hole in the sliding plate, the lever at the left is spring-actuated to push the nut outward. *Hjalmar Dahl, Upplands Vasby, Sweden*

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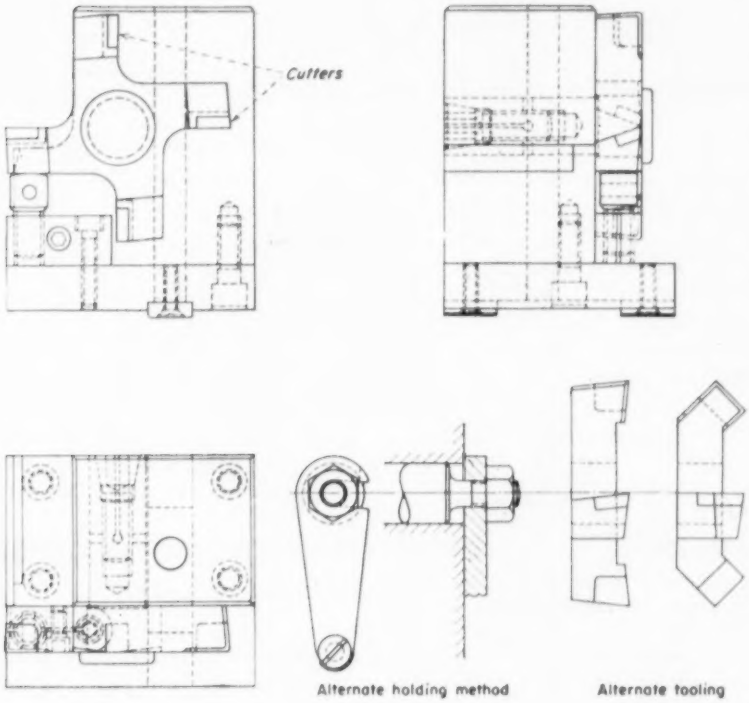


Four-Armed Cutter Holder Gives Rapid Tool Change

Shown here is a tool-and-holder combination which we have found useful on high-production bar-turning center lathes. These machines run at high speeds, to take full advantage of carbide tools, and are normally equipped with air-operated tailstock barrels, rapid return saddle motion, and automatic feed drive.

It is obvious that production on these machines could be increased if some way could be found to replace worn tools more quickly than when using a conventional toolpost. It is this idea that prompted us to make the toolholder design shown. The device should be especially useful when turning cast bars, where slag, blowholes, and variations in hardness cause rapid tool wear.

The basis of the design is that when any one point of a four-point cutter becomes worn or chipped, slackening of a single screw or nut permits a new toolbit to be put into working position. Slight adjustment of the crossfeed screw may be necessary, but a substantial amount of time is made over the usual method of loosening three or four screws in the toolpost, adjusting for center height, packing the tool, and tightening of the clamping screws.

Also, support for this tool is provided very close to the cutting edge, and thrust parallel to the lathe center and away from the headstock is taken against a solid steel face of the toolpost main block. In spite of this close support, there is still room for visibility and chip removal.

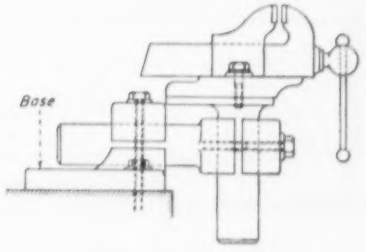
To construct the tool, a hole is bored through the center of the cutter, sized to be a sliding fit for a headed bar which passes horizontally through the main upright block of the toolpost. This bar holds the bore of the toolpost because a central socket-head capscrew with a tapered head expands the slotted walls of the bar.

An alternate holding method is shown, using a simple latch clamp. This is more efficient, though less compact, than the capscrew drawbar arrangement.

The arm of the cutter which is in use is supported by a jackscrew, so that relatively weak material can be used under the cutter. It is important that the under side of each cutter arm be milled carefully, maintaining a constant dimension between bottom face and cutting edge.

The jackscrew is provided with a pin-hole, in case the center height needs adjustment. This might be needed, for example, when changing from one tool design to another.

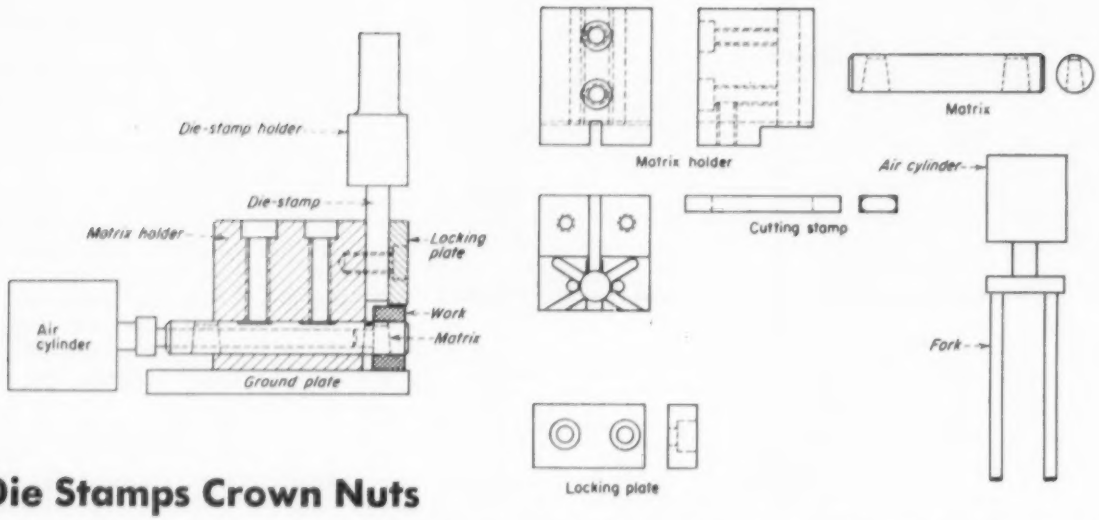
A brass plate which is attached to the main block carries two tenon pieces for location of the holder on the cross-slide. Long bolts, not shown, hold the device very securely in place. *V Lee Brown, London England*



Convert Bench Vise Into Swiveling Unit

An ordinary bench vise can be converted into a tilting and swiveling vise, with full-circle action in two planes. It requires only two support arms and a new, or possibly adapted, vise base.

One arm has a foot with bolt holes that allow assembling it to the bottom of the original vise. It has a round shank that is clamped, in turn, by a yoke bearing on the end of the second arm. Another yoke bearing grips the second arm, holding it to the new base. *W E Podestra, Evesham, England*



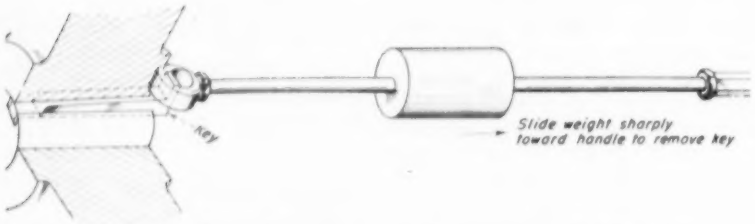
Die Stamps Crown Nuts

The die shown here is designed to avoid the time-consuming operation of grooving the heads of crown nuts, and can boost production as much as 8 to 10 times over standard methods. The matrix holder is mounted on a ground plate, and the round matrix is fastened to the holder so that the die stamp fits precisely into the groove of the matrix. Then the locking plate is fastened on to the matrix holder.

Then the air cylinder is fastened in place behind the whole assembly. The fork is mounted on the rod, so that, when the air cylinder is actuated, two grooves will be cut in the work.

The device is placed on the plate of an eccentric press, with the die stamp holder in a vertical position. Then air pressure is turned on, so the cylinder rod will move the nut outward.

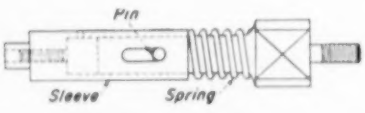
Put a nut on the die stamp and let the machine turn. Stepping on the pedal will cause the nut to be cut and ejected. Now place the nut on the die stamp for the next stamping, and, after repeating this operation six times, the nut will be completed. *Hector von Allbright, Helmund, Holland*



Weight Helps Remove Tapered Key

When fitting keys, as shown in the sketch, it is very difficult to remove them, once they are put into position, without damaging the key. With the tool shown, a key can be fitted without the trouble which usually starts when a key is nearly down to the right size.

To get the key out for the final filing to fit, simply hook the ring over the end of the key, and sharply strike the end of the "key remover" handle with the weight. Inertia will dislodge the key. *J T King, Leicester, England*



Spring-Cushioned Spindle

We've sometimes ended up with damaged thrust bearings, or with ball-retaining rings knocked loose, on our internal grinders. The problem comes up when grinding an ID down to the bottom of a bore, where the ID must blend smoothly with a radius into the bottom of the hole.

This spindle attachment seems to do the trick in cushioning the burr, though it doesn't hamper grinding operations. A slotted sleeve is mounted on the grinding spindle. Inside this rides a secondary spindle that supports the burr. The coiled spring keeps the auxiliary spindle forward unless there is end pressure.

A pin through the small spindle rides in a pair of slots through the sleeve, which transmits torque. The spring is picked for enough strength to keep the burr feeding without chatter, at least until the burr bottoms in the hole. *R Y Wheeler, Cheltenham, England*

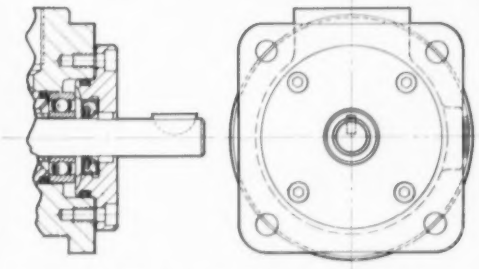
One Waldes Truarc Ring Saves a Pound in Weight Replaces Cast Retainer Plate and Four Screws

Denison Vane Type Pump/Motor

The Denison Engineering Company of Columbus, Ohio uses a Waldes Truarc Beveled Retaining Ring (Series 5002) in their pump/motor to achieve a simpler, lighter, more easily assembled unit and to cut both material costs and production time.

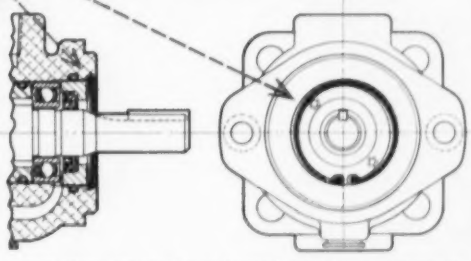
This vane-type power package operates as either a fluid pump or motor without alterations of any kind. Built for 2000 psi continuous duty, rugged construction was essential.

Shaft Seal Subassembly



Experimental Way: One cast retainer plate plus four socket head cap screws hold unit together. Assembly requires skilled labor, machinery, time-consuming careful adjustment.

Shaft Seal Subassembly



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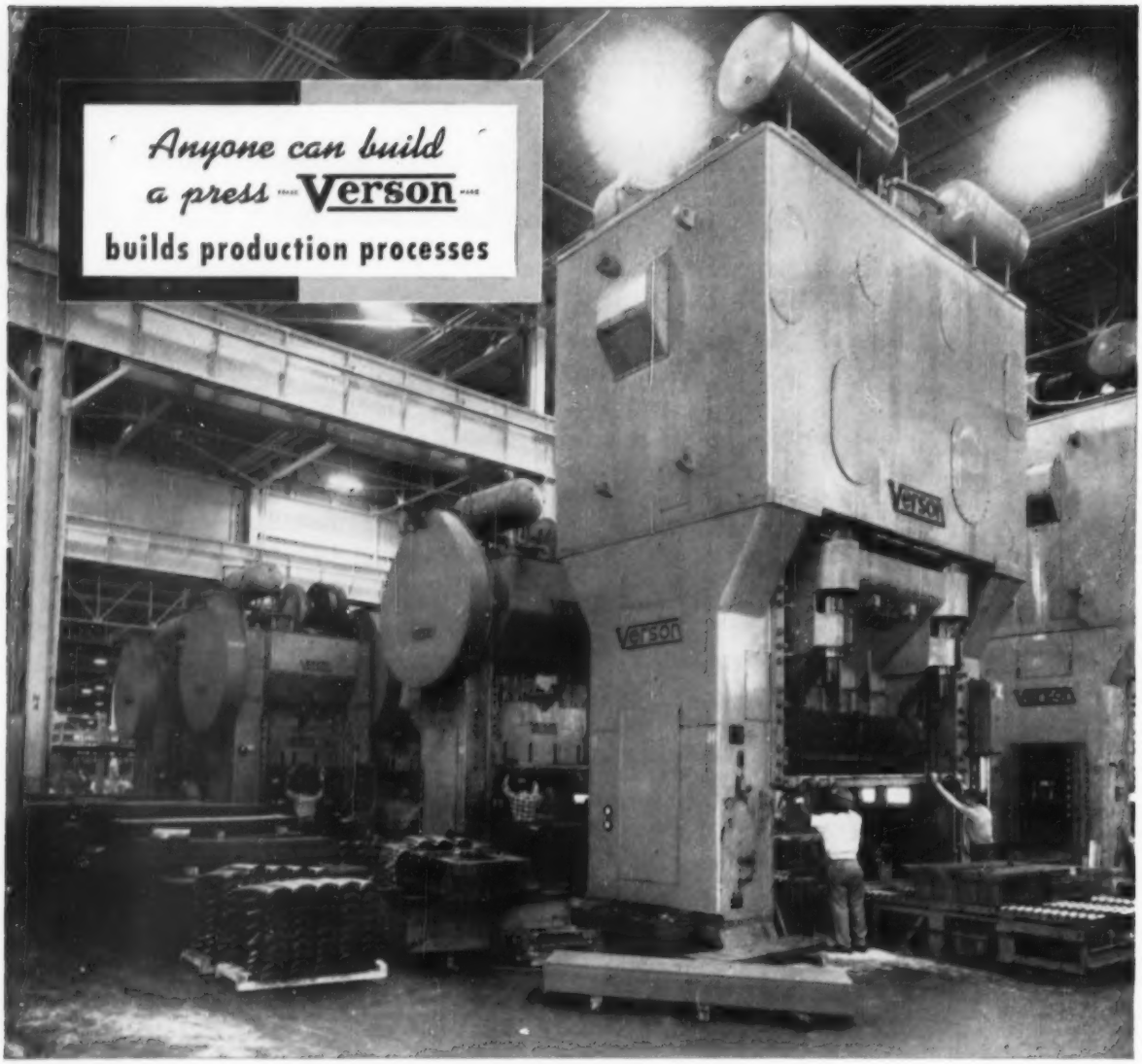

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American Machinist REFERENCE BOOK SHEET

FINISH vs TOOL RAKE . . . I

MAX J KUDERKO, chief metallurgist, and CLAUDE A POTTER, metallurgist
CARBIDE DIVISION, VASCOLOY-RAMET CORP, WAUKEGAN, ILL

Users of older machine tools are restricted, generally speaking, in respect to the finish and metal-removal rate that they can realize with carbide tools, as compared to owners of modern equipment. They have obtained the positive rakes required for soft metals, and for steels when the machine lacks power and rigidity, by these means: (1) used brazed tools ground to positive rakes, (2) designed their own positive-rake holders for inserts, or (3) hollow ground the inserts for conventional negative-rake, clamp-type toolholders.

Recent tests of the new V-R clamp-type, *positive-rake*, toolholders using throw-away carbide inserts give an idea of the finish and depth of cut obtainable from an old machine in good mechanical condition. See following pages for illustrations of chips and finishes produced. The lathe selected for the tests, a 10-yr old Monarch with 18-in. swing, is typical of older equipment in wide use but rarely acknowledged. No attempt was made in these tests to set up an optimum combination of speed, depth of cut, tool geometry, etc, for the machined materials—aluminum, brass, bronze, and steels in low-carbon, alloy and stainless analyses. The purpose of the tests was to show what to expect from positive-rake toolholders on materials commonly machined in many shops.

For direct comparison of the effect of positive vs negative rake on power and finish, 3/16-in. thick triangular carbide inserts were placed in negative- and positive-rake toolholders identical in size but providing different cutting-edge geometry:

Negative-rake assembly: –7° back and side rake, 7° front and side clearance angles, 0° side-cutting-edge angle and 10° end cutting edge angle.

Positive rake-assembly: +6° side rake, 0° back rake, 7° side and end clearance angles, 0° side cutting edge angle and 10° end cutting edge angle.

V-R Grade 2A5 tungsten-carbide inserts were used for turning aluminum, brass and bronze; V-R Grade EM inserts for the steels.

The accompanying illustrations at 20 times magnification depict the finishes produced at ⅛- and ¼-in. depths of cut. It will be noted that the chips produced with negative-rake tools frequently scored the surface just machined. In normal shop practice, this condition would have been overcome by repositioning the hard, non-ferrous, cast-alloy chip-breaker plate specially developed for these toolholders.

The tests disclosed that chips produced with positive-rake tools were almost invariably smooth and clean, while the chips produced with negative rake tools often were ragged, and sometimes distorted badly under the influence of cutting force.

When considering the results of these tests, it is evident that the positive-rake toolholder has a definite place for machining the soft materials, and is helpful to shops that must turn steels on older machines without the power, speed, or rigidity to take required cuts with negative-rake toolholders.

Power Required for Turning with Positive and Negative Rakes

Material	Speed Fpm	Depth of Cut	Feed Ipm	Cutting Load—Hp Positive	Cutting Load—Hp Negative	Ratio Pos/Neg	Notes
Aluminum—1100-F	445	⅛	0.015	0.45	0.79	56.8%	
Aluminum—1100-F	565	⅛	0.015	1.00	1.40	71.5%	
Aluminum—1100-F	445	¼	0.015	1.25	2.34	53.3%	
Aluminum—1100-F	565	¼	0.015	2.00	3.30	60.6%	
Aluminum—2017-T4	358	⅛	0.015	0.62	0.93	66.5%	
Aluminum—2017-T4	428	⅛	0.015	0.78	1.40	57.2%	
Aluminum—2017-T4	358	¼	0.015	1.50	2.17	69.0%	
Aluminum—2017-T4	464	¼	0.015	3.33	3.94	85.0%	
Aluminum—2017-T4	402	¼	0.030	3.27	5.58	58.5%	
Brass—ASTM B-16	342	⅛	0.015	0.37	0.37	100.0%	(1)
Brass—ASTM B-16	359	⅛	0.015	0.62	0.78	79.3%	(1)
Brass—ASTM B-16	359	¼	0.015	1.40	1.71	81.8%	(1)
Brass—ASTM B-16	397	¼	0.015	1.60	1.68	95.0%	(1)
Brass—ASTM B-16	319	¼	0.030	2.05	2.11	97.0%	(1)
Bronze—ASTM B-144	360	⅛	0.015	0.37	0.61	60.6%	
Bronze—ASTM B-144	360	⅛	0.015	0.43	0.66	65.2%	
Bronze—ASTM B-144	360	¼	0.015	1.43	1.74	82.2%	
Bronze—ASTM B-144	423	¼	0.015	1.69	1.85	91.5%	
Steel—AISI B-1113	340	⅛	0.015	1.44	3.24	44.4%	
Steel—AISI B-1113	340	⅛	0.015	1.08	2.62	41.3%	
Steel—AISI 4340	349	⅛	0.015	2.21	3.32	66.5%	(2)
Steel—AISI 4340	377	⅛	0.015	2.95	2.93	100.5%	(2)
Steel—AISI 4340	377	⅛	0.015	3.44	3.30	104.1%	(2)
Steel—AISI 4340	346	⅛	0.015	2.83	2.65	106.9%	(2)
Steel—AISI 4340	314	⅛	0.015	4.93	6.28	78.4%	(2)
Steel—AISI 52100	335	⅛	0.015	2.66	3.68	72.3%	
Steel—AISI 52100	343	⅛	0.015	3.14	3.85	81.5%	
Steel—St. Type 303	256	⅛	0.015	1.09	1.34	81.4%	(3)
Steel—St. Type 303	309	⅛	0.015	1.73	2.03	85.3%	(3)
Steel—St. Type 303	340	⅛	0.015	2.05	2.02	101.9%	(3)
Steel—St. Type 303	300	¼	0.015	4.46	4.92	90.8%	(3)

Note: All dimensions are in inches. In the cases of Brass (1), AISI 4340 Steel (2), and Type 303 Stainless Steel (3), positive-rake turning does not show as much reduction in power requirements over negative-rake turning as is evident with the other metals tested. When first tests on AISI 4340 steel showed a reversal of trend, additional tests were run on this metal as indicated in Tables II and III. No data were taken for use in Table III where stalling was indicated.

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Production: 4 parts per stroke, 500 finish-broached parts per hour at 80% efficiency!

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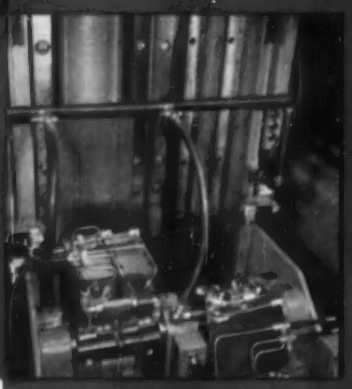
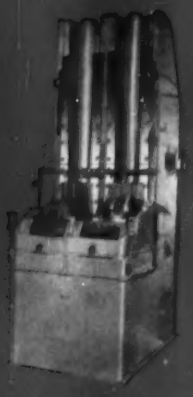




5 ton, 42-inch stroke Double Ram, Vertical LAPOINTE Broaching Machine.

Ask us about the powerful, vibration-free **ELECTRO-MOTIVE DRIVE** which is available on horizontal, vertical and continuous types of **LAPOINTE BROACHING MACHINES.**

LAPOINTE BROACHING of small parts gives you

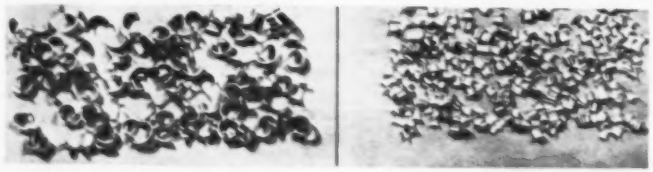
- greater production,
- better finish on machined surfaces.

THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

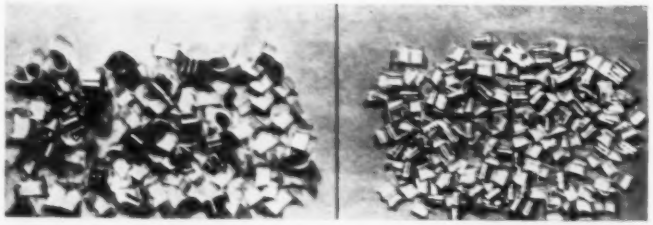
FINISH vs TOOL RAKE . . . II

ALUMINUM (1100-F alloy)—565 fpm, 0.015 ipf., hardness, 56-58 R_B



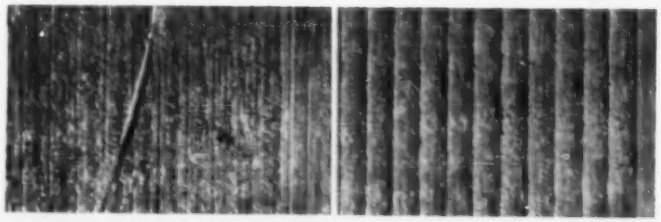
A—Positive rake, ⅛-in. cut

B—Negative rake, ⅛-in. cut



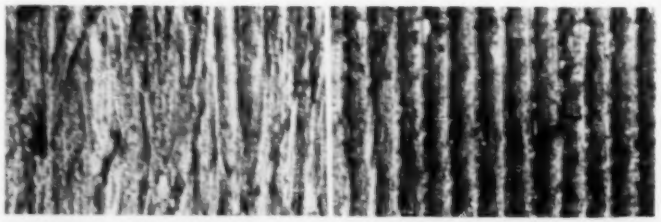
C—Positive rake, ¼-in. cut

D—Negative rake, ¼-in. cut



FINISH: Negative rake—150 mu-in.
Depth of Cut—⅛ in.

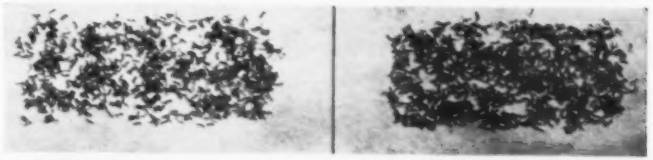
Positive rake—200 mu-in.



FINISH: Negative rake—450 mu-in.
Depth of Cut—¼ in.

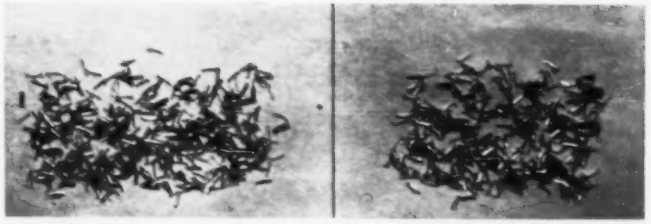
Positive rake—200 mu-in.

BRASS (ASTM alloy B-16)—359 fpm; 0.015 ipr; hardness, 55-62 R_B



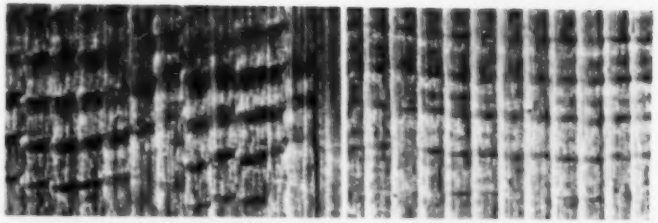
A—Positive rake, ⅛-in. cut

B—Negative rake, ⅛-in. cut



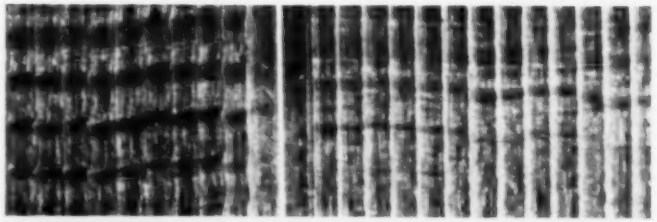
C—Positive rake, ¼-in. cut

D—Negative rake, ¼-in. cut



FINISH: Negative rake—150 mu-in.
Depth of cut—⅛ in.

Positive rake—160 mu-in.



FINISH: Negative rake—140 mu-in.
Depth of cut—¼ in.

Positive rake—160 mu-in.

The Steel with "Built-in Productivity"

If your problem is to produce quality work at highly competitive prices—

If steadily rising operating costs make your problem almost impossible—

TRY LEDLOY*

the Steel with "Built-in Productivity"

Copperweld Aristoloy Leaded Steel gives freer machining, faster feeds and speeds and longer tool life.

The use of Ledloy often eliminates final machining because it cuts clean for finer finish.

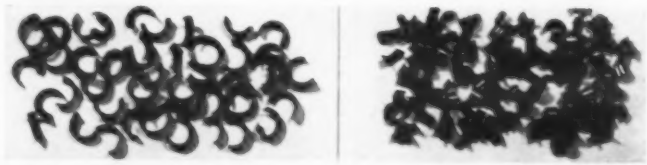
For proof of increased production at lower cost, try a partial run with Aristoloy Leaded Steel.

*Inland Ledloy License

ARISTOLOY STEELS

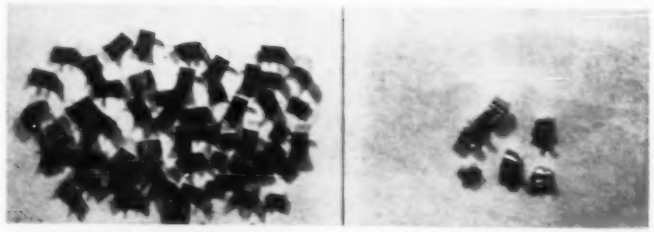
COPPERWELD STEEL COMPANY • Steel Division • WARREN, OHIO

CARBON STEEL (AISI B-1113, cold finished)—340 fpm; 0.015 ipr; hardness, 15-24 R_C



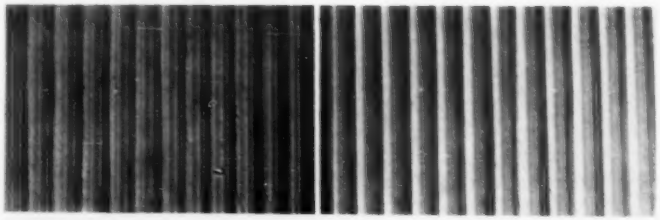
A—Positive rake, ⅛-in. cut

B—Negative rake—⅛-in. cut



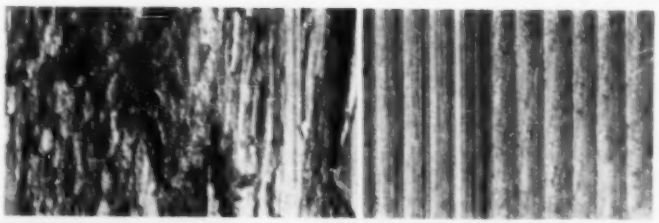
C—Positive rake—¼-in. cut

D—Negative rake, ¼-in. cut



FINISH: Negative rake—175 mu-in.
Depth of cut—⅛ in.

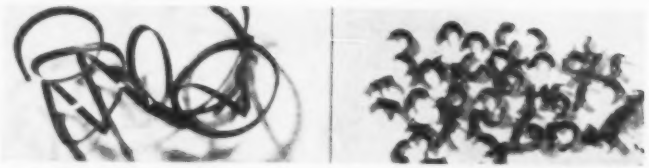
Positive rake—150 mu-in.



FINISH: Negative rake—torn
Depth of cut—⅛ in.

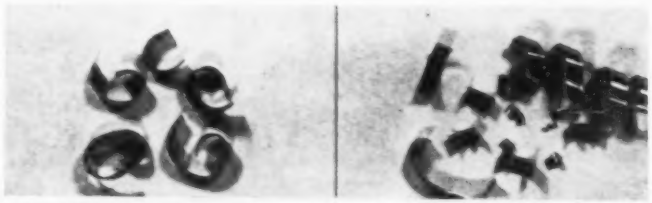
Positive rake—150-175 mu-in.

ALLOY STEEL (AISI 4340, hot rolled and annealed)—377 fpm; 0.015 ipr; hardness 10 R_C



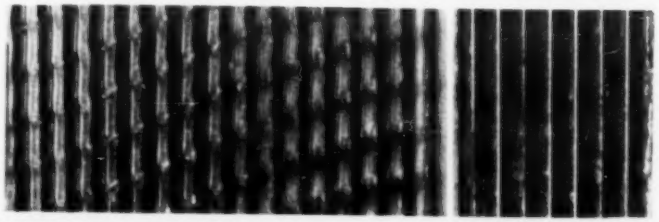
A—Positive Rake, ⅛-in. cut

B—Negative rake, ⅛-in. cut



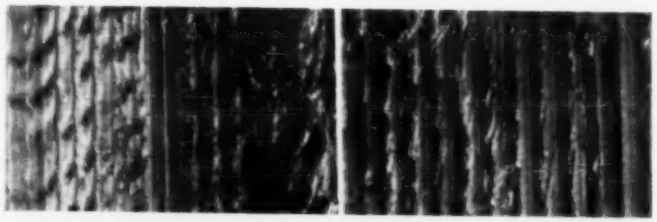
C—Positive rake, ¼-in. cut

D—Negative rake, ¼-in. cut



FINISH: Negative rake, 200 mu-in.
Depth of cut—⅛-in.

Positive rake, 200 mu-in.



FINISH: Negative rake—*
Depth of cut—¼ in.

Positive rake—*

*Torn—Lathe stalled soon after start of cut

Here it is!
The NEW V-R TOOLHOLDER with 6° positive rake

Works Like Positive Rake Brazed Tool . . . Saves Money with "Throw-Away" Inserts, Cast Alloy Chipbreaker Plate

AR brazed tool — **New V-R 6° Positive Rake Toolholder**

Both will do exactly the same operations!

SAVES MONEY 8 BIG WAYS

- Free cutting action of 6° positive rake ends excessive heat . . . eliminates distortion of piece parts.
- Allows use of harder grades of carbide than are normally used in brazed tools.
- Elimination of excessive heat with positive rake toolholders allows machining to closer tolerances.
- Patented V-R "elevator" locks "Throw-Away" insert solidly in toolholder at 6° positive rake angle . . . firm as a brazed tool.
- Cutting edge automatically positions on center . . . saves setup time.
- In case of tool "wreck", elevator is quickly and easily repaired or replaced.
- Insert indexed to new cutting position in seconds.
- Eliminates all carbide grinding.

Now V-R combines the operating efficiency of a positive rake brazed tool into a 6° positive rake toolholder with the proven economy of "Throw-Away" blanks and a cast alloy chipbreaker.

NOW A TOOLHOLDER FOR MACHINING METALS REQUIRING POSITIVE RAKE

Aluminum, soft brass, copper, bronze, stainless steel and all other types of materials, including alloyed steels can now be machined more easily and economically than ever before.

All the advantages of positive rake design can mean savings in your plant with this new V-R Toolholder. Call your V-R representative or write today for complete information.

Vascoloy-Ramet CORPORATION

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

MANUFACTURERS OF CEMENTED CARBIDES • CARBIDE TOOLS AND BLANKS • TOOLHOLDERS AND INSERTS • TANTUNG TOOLS • DIES • MINING TOOLS • INVESTMENT CASTINGS

808 MARKET STREET WAUKEGAN, ILLINOIS

Talking Shop . . .

Flaw Finders

ERIE RAILROAD is using two types of back-pack flaw detector to find flaws within joint-bar limits of a rail and on switch stock rails—where the big Sperry rail car doesn't pick 'em up. Both types are electrical, the Audigage by sound waves transmitted to earphones as the detector is passed along the rail, and the Sonirail operating similarly but with a meter so a visual signal is given in addition. In both cases, a film of oil is put on the rail for better transmission, and amount of pitch change in the transmitted tone indicates the size of the flaw.

Transistor

TWO NEW USES for transistors are reported by Westinghouse. One is a hot-metal detector with a photo-transistor as an infra-red sensing device (above 700 F). The other is a constant-current motor control using static, semi-conductor elements.

Poker Game

A NEW GIMMICK for promoting safety is being used by Kaiser Aluminum & Chemical Corp at Mead, Wash. Each employe has a safety card attached to his weekly pay check, carrying the face of a regular playing card, a safety slogan, the employe's name, number and date. Thus, in five weeks, each man has a poker hand. Each week, clock numbers of all employes go into a hat. From these, 25 are drawn. The first 10 who know the safety slogan printed on their cards win $5 certificates. At the end of the 5-week period, the winners of the "poker game" are picked on the basis of highest and lowest hands. Each winner gets a $100 certificate. Anyone with a lost-time accident during the 5-week period has his hand declared a "misdeal." Says James McMahon, safety supervisor: "It's the biggest poker game in the world. There are more than 1600 hands in the game, where everyone has a chance to win and no one can lose."

Goodbye, Picker!

LOCK PICKERS may find slim pickings in future combination padlocks as a result of a current study at Armour Research Foundation, Chicago. Dudley Lock Corp has started a research program to find where wear occurs, accelerating 20 years of wear into 24 hr, and doing eight locks at once. Thus far, tests show that forces acting on the spring tension cause wear, so designs will be modified to overcome this. Materials are being changed, heat-treating improved, and pawls being modified.

Punch Card Grinding

BAY STATE Abrasive Products Co, Westboro, Mass, has put in an electronic computer with punch cards. The job is to calculate manufacturing formulas for grinding wheels. The setup will translate the abrasive-engineer's wheel specification into a manufacturing formula for the factory—and will do in seconds what a whole department can now do in a day. Harvard, using the Mark IV Computer, calculated all increments in wheel hardness, grain concentration and the like—thousands of man-hours of work in 1½ hr. Increments were spaced equally along straight-line progressions. These "constant" data, plus variables like quantity of each ingredient, packaging and shipping information, are fed to the Bay State machine on cards, and the machine delivers a typed manufacturing form that goes directly to the plant. Meanwhile the machine stores data on raw materials used, etc, for later tapping for marketing and sales statistics. The management is now thinking about application of the machine for computing proportions of basic ingredients.

Left Shoe—Right Foot

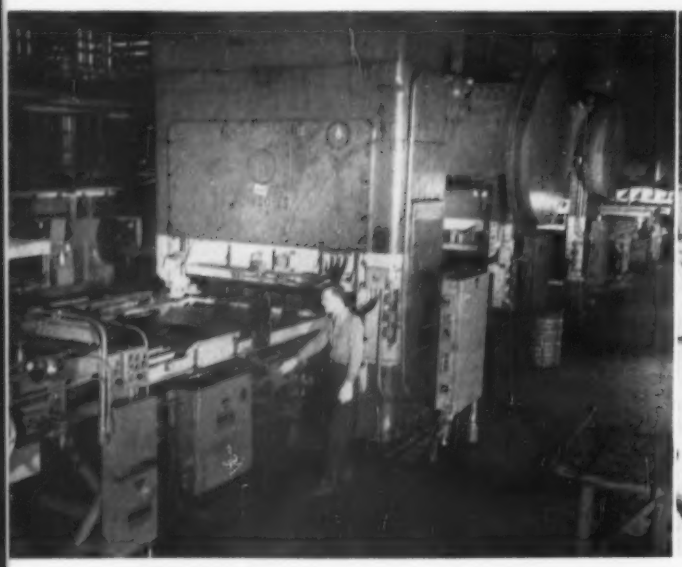
TWELVE YEARS AGO, according to *The Detroit Times*, a 29-year-old CIO economist named Harold J Ruttenberg conceived the idea of a guaranteed annual wage. Today, Ruttenberg is president of the Stardrill-Keystone Co, well-drilling machinery maker of Beaver Falls, Penna. His union employes (CIO) are threatening to strike if he doesn't agree to the GAW. Mr Ruttenberg in December *Harper's*, tells how it feels to be "roasted by one of my own ideas." He feels that GAW would bankrupt his company, but will sign for it if the union will call overtime, holiday and vacation pay part of it—and if an eligible employe will forfeit a week's GAW for each day of absence from work without just cause. The shoe is now on the other foot for him—and his reasoning is exactly that of management elsewhere, a guarantee "only to the extent that the employer remains solvent and can compete profitably."

Glass Soldering

AN UNUSUAL and simple technique for soldering aluminum, stainless, glass, ceramics and similar materials without special equipment has been developed at U of C's Los Alamos (NM) Scientific Laboratory. According to Jos C McGuire, Chemistry & Metallurgy Div, who developed it, only a hand grinder is needed, and the trick is to do something every apprentice is taught not to do. The hand grinder is first used to grind steel to preheat the wheel (or exterior heat can be used), then it is ground into a soft solder such as Wood's metal or 60-40 lead-tin. The soft solder melts and loads the wheel. The solder-loaded wheel is then applied to the surface to be soldered until slight abrasion occurs (at ordinary grinding pressures). The heat of friction again melts the soft solder, which flows onto the freshly abraded surface and forms an intimate contact. After this tinning operation, soldering is done in the usual way with standard 50-50 lead-tin solder.

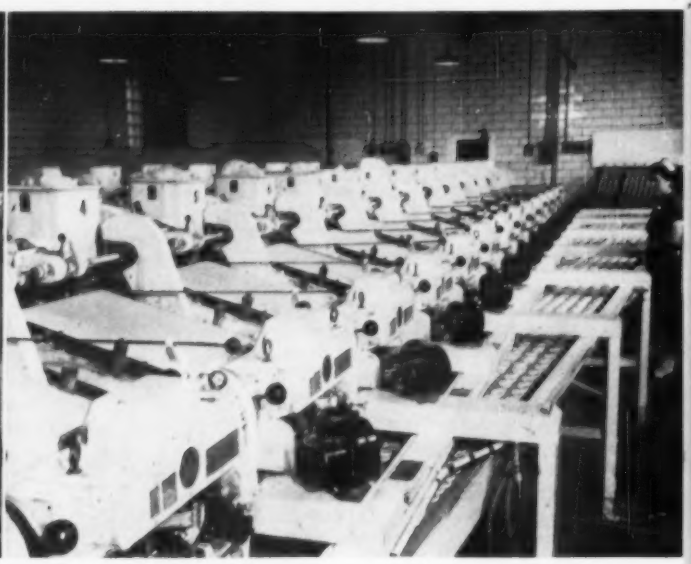
The other surface is also given the new treatment if it is a material not ordinarily "wetted" by solder. No flux, surface cleaning, or pre-treatment is used. For materials like soft glass, Pyrex and ceramics, best tinning is done with a mixture of Wood's metal and 50-50 indium-tin. However, when glass is soldered to glass, or ceramic to ceramic, it is necessary to use flame or furnace heating to get enough heat to the surfaces to be joined. A suitable wheel is found to be medium grit, ¼-in. dia by ½ in. long, although type and size are not critical.

News of Metalworking . . .



Automated press lines . . .

REFRIGERATOR DOOR BLANKS are automatically moved from one stamping station to the next through this pressed steel line. One of the scenes in new General Electric film illustrating factors of automation



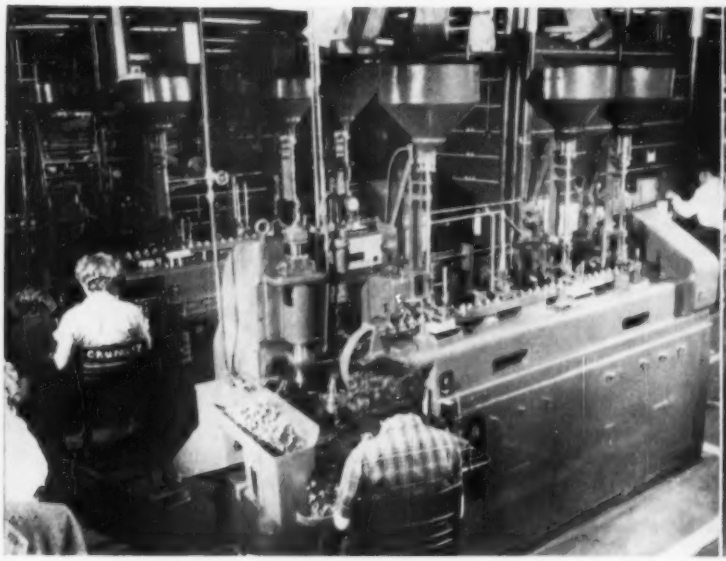
. . . and pretzel benders

BATTERY OF AUTOMATIC MACHINES in a pretzel factory, with one employee watching for machine error, is typical of broad applications of automatic principles in manufacturing today. Conveyor belt carries the formed pretzels directly to the baking oven

How Automation Can Be Applied Now in

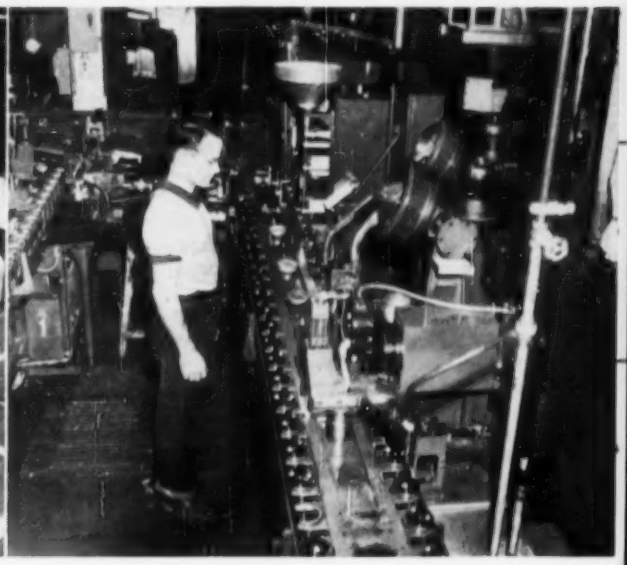
Where do you stand?

STEP CHART shows level of mechanization from hand operation to complete automation. Several levels are likely in a given plant. Manual area is still common in toolrooms and assembly operations, mechanization area is most common for both handling and manufacturing, but operations are moving into top area where all merge into a continuous flow of automatic operations



Condenser merry-go-round . . .

PARTS FOR CONDENSERS are fed into small merry-go-round by employees. Following punching, parts move automatically to feeder line (upper right) for additional forming and stamping—typical combination of two levels of mechanization



. . . and automotive assembly

SMALL AUTOMATIC ASSEMBLY LINE is supervised by an employee who watches for machine error as parts are processed. Assembly is one of five areas in which automation can be applied, and is attracting special interest now

Five Key Areas of Metalworking Production

NEW YORK—The opportunities of automation lie in progressively upgrading operations and people with the tools and methods available today. Progress along this line is not limited to high-volume items. By applying more mechanized equipment, almost any production operation can be moved one step up the scale (see chart on opposite page).

These points are made in a 30-min documentary film, "This Is Automation," describing the history, growth, concept, and future of continuous automatic production. The film, with a related 36-page booklet expanding on the basic principles, was produced by General Electric and marks the tenth anniversary of the firm's "More Power to America" program as a continuing method of sharing GE's knowledge and technology with Metalworking and with all of industry.

How to Start

First step is to perform each of the five processes of manufacturing automatically. These are making, inspecting, assembly, testing, and packaging. Then, and only then, is it possible to tie them together with automatic control and handling to achieve true automation.

Major factors influencing automation include product design, plant layout, production equipment, and business planning.

- **Product design.** Perpetuation of old designs made on elaborate machines that duplicate manual operations is an expensive habit. With changes that are only minor from a tooling standpoint, one automated unit may be able to produce parts for an entire series of properly designed models.

- **Plant layout.** Automated production must be laid out on a product-line rather than a process basis. However, in a plant where job-by-job departmental layout is still best, individual high-volume items can be set up as "islands" of automation. As these are spotted through the plant, increasing opportunities for extending them are likely to be found.

- **Production equipment.** Existing standard machines can be arranged in product lines and tied together by transfer devices. Another approach is to purchase new standard equipment with built-in automatic transfer devices and perhaps including automatic gaging and tool adjustment. A third choice, is to build special equipment using as many standard components as possible. This third choice is often necessary, but should never be made if the hard-to-handle features that make it necessary can be designed out of the product.

- **Business planning.** Teamwork is essential for automation. A high degree of coordination and joint planning by engineering, manufacturing, marketing, finance, and personnel departments is essential. Joint study groups are usually the best approach. They can prepare an integrated proposal, after considering all factors, for final decision by company executives.

New Skills Required

The film also outlines the special technical skills required, suggests sources of outside help, and shows how people who work in factories will benefit from automation.

ARMY AIR ARM BUILDUP:

Zooming Procurement Augurs Interservice Row with Air Force

WASHINGTON—Over the past two years, metalworking companies who produce tanks, trucks, artillery, and most other hard goods for the Army have seen their military business whittled away because of heavy cutbacks in Army programs. But meantime, one segment of the metalworking industry has a booming market on its hands—namely, the producers of helicopters, liaison planes, and components for light aircraft.

The wheel-bound, foot-slogging Army is becoming an important new customer for aircraft manufacturers. In fiscal year 1956, the Army will buy $185 million worth of light aircraft and place another $30 million in research and development contracts for newer models.

You can see the upward trend in Army plant procurement in these figures: $33 million in 1953, $125 million in 1954; $163 million in 1955. How much further the trend will go depends pretty much on how the Army makes out in a serious policy dispute over aviation with the Air Force that's now heating up the Pentagon.

These are the issues:

● Ever since Korea, the Army's air arm has grown in size from a few hundred planes to 3400 aircraft on hand and at least another 1000 on order. The Air Force is jealous over this growth, claims the Army is trying to take over traditional Air Force missions—like aerial transport of troops. Even more significantly, the Air Force charges that by duplicating Air Force missions the Army is wasting defense money.

● The Army, in turn, is peeved over Air Force strategic policy, which places a low priority on the Army's role in warfare. It claims the Air Force does not buy enough transport aircraft to move troops and equipment into battle, and allows the Army little if any control over close-support fighter planes in ground combat.

Right now, the Army is strapped by a Pentagon rule limiting the Army to ownership of fixed-wing planes under 5000 lbs and helicopters, and to field flights within a combat zone 50 to 100 miles deep. The Army's "organic" aircraft are also carefully limited to functions: observation flights, transport of equipment and small units of personnel, medical evacuation, wire-laying, and the like—but only within the narrow combat zone.

The Army is now bucking against these restrictions. For one thing, it would like to have the weight limitation scrapped and be able to buy any plane needed for its authorized air missions. It would also like to have the official definition of a combat zone changed.

The Army's argument goes like this: technological advances since 1952 have made the narrow battlefield definitions old-hat; in a future war there would be no battle lines like before — troops would be too widely dispersed for protection from nuclear weapons.

If the Army wins out in its drive to expand its aviation program—gaining new authority to buy heavier planes that can fly faster and further than the ones it has now, the effect on the aircraft industry will be substantial: companies now selling planes to the Army will be in for heftier orders, other aircraft firms will be competing for a chunk of a brand-new defense market.

Already, United Aircraft Corp's Sikorsky Division, Piasecki Helicopter Corp, Bell Aircraft Corp, and Hiller Helicopters are knee-deep in Army business. Others, like McDonnell Aircraft Corp, a big Navy supplier, and Fairchild Engine & Airplane Corp, which sells heavily to the Air Force, have important development projects.

From the pace of latest Army aviation plans, you would think the Army is optimistic about its future in the air. It is stepping up pilot training, will turn out at least 1200 fixed-wing pilots in 1956, compared to 750 last year. It is expanding its aviation center at Fort Rucker, Ala, at a cost of several million dollars. And in November, after a long-time struggle, the Army was finally authorized to run its own aviation maintenance and supply depots.

About 60% of the Army's aircraft are helicopters, the remainder fixed-wing "hedge-hoppers." The 'copters range in size from Bell's 1435-lb H-13, which carries two men and is used as a divisional recon or courier plane, to Piasecki's 8600-lb H-21 which carries 20 men or 4500 lb of cargo. The fixed-wing planes are essentially military versions of light civil aircraft—Cessna's L-19, a two-place observation plane, DeHavilland L-20 Beaver six-pace utility plane and U-1 Otter, carrying eight, and the Beech L-23 twin-engine command plane, carrying five.

Within the next year, Sikorsky will start delivering a twin-engine cargo helicopter, the H-37, which can fly on one engine. During the same period, the Army plans to borrow 10 Cessna T-37 twin-jet trainers from the Air Force for field testing. The Army thinks small jets may be suitable for observing atomic artillery and guided missile firing.

In development are several additional Army planes. Examples:

● McDonnell's XV-1 convertiplane, which takes off vertically like a fixed helicopter and flies forward like a fixed-wing plane. Tests are being carried out on two prototypes.

● Bell's XV-3 convertiplane, which has twin rotors on the wing tips. The rotors can be let down into a horizontal position for use as propellers after a vertical takeoff.

● Bell's XH-40 turbine-powered helicopter, which reportedly climbs as fast as a World War II fighter. The producer has rolled out a full-scale mockup.

In addition to the change in Pentagon rules restricting its planes—to allow procurement of heavier planes to be flown in a larger zone of operations—the Army wants more say in its dealing with the aviation industry. Under present Defense Dept policy, almost all Army aviation procurement and research and development is handled by the Air Force. Two helicopter models are bought through the Navy.

On the matter of air transport, the Army is peeved over Air Force plans to cut back its force of troop-carrier wings from 17 to 11 by 1957. Another decision that rankles the Army: the recent cutback in production of Fairchild C-123's.

Basically, the Air Force's reason for de-emphasis on air transport stems from the service's strategic concept: that another war would be decided quickly with airborne nuclear weapons, that ground troops would not be needed in the initial decisive stages.

Move Over, Henry!

Midwest...

DETROIT—Walking with head held high past the graves of almost 2000 firms that have tried — and failed — to stay in the automobile business, a David has come forth to battle with the Goliaths of autodom.

This David is made up of 12 boys and 12 girls, all in their teens, and all members of the Wyandotte, Mich, Junior Achievement group.

Just One Car

At a press party December 15, conspicuous because of the absence of musical comedy acts, fine foods and liquor, the 24 teen agers over coffee and doughnuts told reporters of their plans to build an automobile —just one. Here's how it all began:

Junior Achievers — and they are legion in southeastern Michigan, where more than 6000 of them learn the whys and wherefors of business every school year—form groups and go into business for themselves, with the blessing of local industrial and civic groups. Usually, they confine their efforts to manufacturing small items, or to performing some service. They form in October, elect officers, decide what they will make, sell a few hundred shares of stock at 50¢ a share, and disband in May.

That's the way it usually works. But the Wyandotte gang thinks big. They conceived the idea of building and marketing an automobile—not a fly-by-night, jerry-built Whoositz —but a real, honest-to-goodness car that anyone would be proud to own. But how? The allowances of 24 teen agers are hardly designed to buy the major items of plant and equipment needed to build a car . . . but they had an idea.

The Wyandotte group of JA's is sponsored by Chrysler Corp's Marine Engine and Industrial Division. Why not take the idea to Chrysler? The group's adult advisor, G M Potter, liked the idea. Go ahead and sell stock, he told them. They did, 2000 shares at 50¢ each. Incorporated and armed with $1000, they leased a corner of an aluminum storm window plant.

Then they went to see Dodge Division of Chrysler: "We want to buy sub-assemblies from you. We'll assemble them and we won't use the Dodge nameplate. We've got our own factory, and we've got some tools . . . so how about selling parts to a recognized corporation, Mr Dodge?"

Dodge officials were intrigued. They looked the plant over, and they looked the eager youngsters over, and liked what they saw. The Dodge people checked bank statements and credit ratings, advised the JA's they needed some sort of insurance program, and agreed to supply the subassemblies at standard prices.

The need for insurance brought a bid from one Robert P Wittbold, a Wyandotte realty and insurance man who had assisted in finding the factory space (top rental figure, as set by the group, $10). Wittbold made a bit for the business and was invited to present his case and his policies at a JA Board of Directors meeting.

Talking over the whine of power saws and the deep growl of a router, Wittbold solemnly and carefully defined the various types of insurance that automakers need. When he came to the definition of burglary insurance . . . "theft in which a visible sign of forced entry is present, made during hours when the plant force is not on the premises . . ." a JA member stopped him:

"You mean," the youngster said, "that if one of us should pick up a radiator cap or a couple of spark plugs — accidentally — the firm will get no reimbursement?"

Wittbold smiled. "That's what the policy says in effect. However, we have another policy to cover such internal losses; it is called 'employee fidelity' and the premium . . ."

Carl Szejda, 16, of Wyandotte, president of the group, rapped for order, "We have a loyal bunch of people. I don't think we need to insure ourselves against ourselves. Let's get on to the medical and health coverage."

That's the way it went. First things first—ideas, capital, insurance, plant layout and so forth. Then with the details ironed out and everything in readiness, came the great day, November 30, when Dodge delivered the engine—a "block assembly" with pistons, camshaft and crankshaft already in place. Dodge figured that the complete internal buildup of an auto engine calls for precision work and tools not available to the JA's.

Other stuff came in, like heads, manifolds, air cleaner, oil dipstick, oil filler cap—and was promptly sent out for chromium plating. The whole engine took just about a month to assemble and pretty up. It was finished on December 28. The front end assembly will be ready January 11; the front assembly and chassis will be completed two weeks later; and the day-of-days when JA's unique car goes on sale is April 11. It'll be named the Royal Achiever.

All of this is done on a work schedule of one day per week, two hours per work day. Pay per person is set at 10¢ an hour; but provisions have been voted upon and have passed to prevent production from falling behind schedule. If such appears to be the case, the group will work Saturdays at time-and-one-half.

Officers of the group, who receive a monthly sum of $1.50 in addition to what they earn on the "line," have had their salaries deferred by group vote until the project is completed. This latter measure met with the complete approval of the group treasurer, 16-year-old Tom Szeles of Wyandotte, who measures up to any corporation treasurer in his guardianship of funds.

Coincident with the formation of the auto assembly group, another Junior Achievement group formed to act as a public relations-publicity counsel for the automotive group.

The publicity group, which accepted the auto group as a client for 15% of the net profits made from the car, has prepared professionally-acceptable stories about the car and the JA group, put together a press kit, and has thrown a press party for automotive writers.

The experience gained by this group of Junior Achievers is going far beyond that of most Achiever groups. The problems of inventory, insurance, manufacturing procedures, paint selection, upholstery, nameplate design—even the cost of renting and cleaning of coveralls—are not too dissimilar to the problems faced by other groups. But here they are magnified by the very scope of the operation—believed to be the most ambitious ever undertaken by any Junior Achievement group.

Field Report USA:

Ohio newsnotes . . .

Republic Steel is combining its Bolt & Nut and its Chain Division into a Bolt and Chain Division, which will also handle tool steel and cold formed parts sales . . . **Babcock & Wilcox Co,** Barberton, Ohio, has the first AEC contract to build reactor fuel elements . . . **Sharon Steel** has sold its Niles, Ohio, rolling mill to **Mallory-Sharon** . . . **Lincoln Electric Co,** Cleveland, bellwether of U S profit sharing companies, paid upwards of $5 million to 1236 employees as 1955 incentive bonus pay in 1955 — 101% of its 1955 payroll . . . **Lincoln** also has a plan whereby the firm will remanufacture your old welder on a production line basis . . . **American Welding & Mfg Co,** Warren, Ohio, has bought out **Standard Boiler & Plate Iron Co,** Niles . . . **Jones & Laughlin Steel Co** may make Columbus the center of its multi-million-dollar steel warehousing expansion.

Detroit briefs . . .

Auto companies are going in more and more for hiring big time auto racing stars as a way of publicizing their cars, **Chevvy** has Mauri Rose, **Ford** has Pete DePaolo, **Mercury** has Bill Stropp, **Packard** has Bill Holland, and **Pontiac** has just hired Lou Moore . . . Race drivers think the **Nash Rambler** will sweep the stock car boards when it gets its **American Motors** V-8 engine late next year, particularly on short tracks . . . **Ford** is still pushing its safety program full blast, is offering its safety films on crash effects for national distribution . . . Ground has been broken for **Lincoln's** headquarters plant at Novi, Mich. It'll have an annual output of 80,000 cars, will be completed by mid-1957 . . . **Detroit Army Ordnance Arsenal** is letting **Wayne University Medical College** use its betatron for cancer research "after working hours." During working hours, the betatron inspects for defects in metal up to 20 in. thick . . . **Studebaker** says orders are rolling in at "better than 1000 a day" for its '56 models. The President four-door sedan is accounting for 20% of the total, double its last year's demand. The Golden Hawk is going great guns, too . . . **GM's A-C Spark Plug Division** will build a 75,000-sq-ft in Milwaukee for electronics and defense products output . . . **Collapsible Tube Manufacturers' Council** (toothpaste tubes, etc) says that for the first time in history its sees a billion-unit-a-year output in '56 . . . **Briggs Mfg Co,** Detroit, plans to spend $7 million for a new steel enameling plant and office building adjoining its 15-Mile Rd stamping plant.

Elsewhere in the Midwest . . .

National Lock Co, Rockford, Ill, plans to build the "world's largest screw and bolt plant" on the outskirts of that city. The one-story, 600,000-sq-ft plant will cost about $5 million, and will take over a large part of present Rockford manufacturing operations . . . **Faesler Tool Co,** Moberly, Mo, maker of roller-burnishing tools, has become part of the **Madison Group,** specialists in inner-diameter machining. It will operate as a subsidiary of Madison Group's **Flightex Fabrics, Inc** of Providence, R I . . . **Automatic Electric Co,** maker of dial telephone systems, is building a $16-million plant on the site of the former Westward Ho golf course 15 miles outside Chicago. It'll have 1.3-million sq ft of floor space . . . **Mattison Machine Works,** Rockford, Ill, recently hosted its foreign sales reps for a three-day sales training course. Eight of them, from South America and Europe, attended, along with U S representatives . . . Steel output in the Chicago area is at a record high. Total for the first 11 months of '55 was more than 19.7-million tons . . . **Studebaker-Packard** has a multi-million-dollar Air Force contract to make J-57 jet engine parts. It's the first time since Stude and Packard were combined that the company has obtained a major AF contract . . . L D Silberstein's **Penn-Texas Corp** has stock-traded to acquire **Hallicrafters Co,** Chicago radio-TV maker.

South . . .

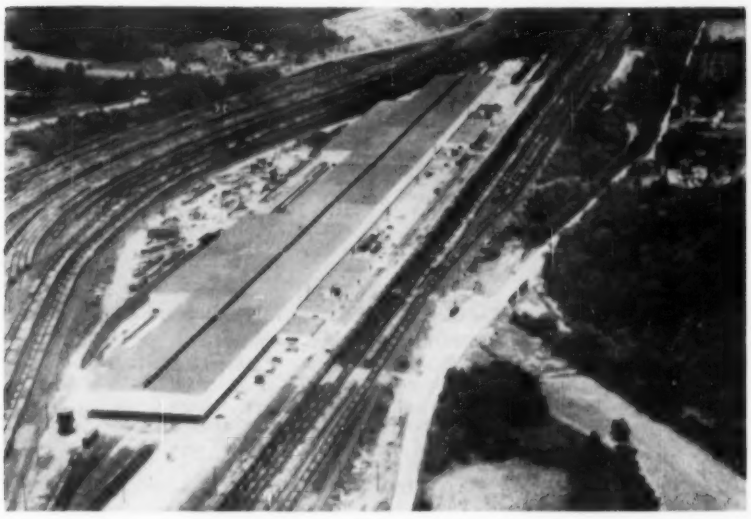
Around the South . . .

The South has one of lowest rates of unemployment in its labor force of any region in the country, and one of the lowest in the history of the area. From April to September of this year an average of only 3.8% of the South's labor force was unemployed. This compares with 4.4% in the Northeast and 3.9% in the West. In the north central area the rate of unemployment was slightly below that of the South, for a figure of 3.1%. Current figure represents a decided drop from 5% for the same period last year. Figures were prepared by the U S Dept of Commerce, Bureau of Census field report . . . **Boyles Galvanizing Co** of Tulsa, Okla, will build a new $250,000 branch plant at Nashville, Tenn. Company specializes in galvanizing fabricated steel products and will be the only one of its kind in the Nashville area . . . Excavation has begun on **Tennessee Products & Chemical Co's** new $2.5-million ferro-alloy plant at Rockford, Tenn. Plans call for a six-furnace plant which will provide employment for about 150 workers with an annual payroll of $700,000 . . . **Allied Structural Steel Corp,** Chicago, has purchased the Knoxville plant of **Glazier Steel Corp** . . . During the past 12 months, new industries or expansions in existing industries have created 13,000 jobs in Alabama—44 new industries located in the state, with a capital investment of close to $120 million. Manufacturing plants in the state spent another $81 million for expansion. Typical of Alabama industrial growth is the huge $11-million expansion program of **Reynolds Metals Co** at Listerhill. Plant upped production primary aluminum output 12-million lbs per year—a 40% expansion . . . **Newport News Shipbuilding & Drydock Co** is working a conceptual design of a modern dry cargo ship powered by a pressurized water nuclear reactor. Company is working on the project under a contract with AEC and the Maritime Administration. As of close of the fiscal year, Newport News had a backlog of about $151 million, and employed close to 13,000 workers . . . **Turner Manufacturing Co,** Statesville, N C, has acquired the Earthmaster tractor plant of Sun Valley, Calif. President Turner A Duncan plans on transferring Earthmaster's manufacturing facilities to Statesville during December. The move to North Carolina is described as the largest migration of farm manufacturing machinery in the history of the industry.

West . . .

Los Angeles Area briefs . . .

Norris-Thermador Corp has completed a $125,000 product development lab in East Los Angeles to consolidate research on electrical cooking, heating and cooling . . . **Hughes Aircraft** has bought the El



Pennsy Opens Biggest Freight-Car Repair Shop

WITH TWO OF ITS THREE HALF-MILE-LONG ASSEMBLY LINES ROLLING, Pennsylvania RR's $12-million, 2760-ft-long Samuel Rea Shop is ready to repair up to 50 freight cars a day. Longer (2760 ft) than the Empire State and the Eiffel Tower placed end to end, the shop is from 180 to 270 ft wide, 54 ft high, and covers 17 acres. Inbound cars enter the shop from assembly tracks. Badly worn parts are scrapped: re-usable ones are straightened and welded. Cars are then painted, weighed, stenciled and sent to classification tracks for return to service. Production lines are used in working on car parts, such as replacement of wheel trucks by temporary trucks while wheel trucks are dismantled, reconditioned or replaced in another shop. Repaired wheels and trucks come together again in the truck assembly shop

Segundo, Calif, **Nash** assembly plant from **American Motors,** will use the 500,000-sq-ft facility to house its new **Hughes Products Division . . . Northrop Aircraft** will shortly start work on an $8-million facilities consolidation program. Biggest item: a $3.5-million, 250,000-sq-ft engineering center . . . **Lovequist Engineering Co,** machine tool and aircraft parts manufacturer will double its present capacity when it moves into its new $750,000, 12,000-sq-ft plant at Van Nuys . . . **H W Loud Machine Works,** Pomona, has nearly completed a $700,000 expansion program, including $150,000 to enlarge its tool and die department so the plant can handle all its own production tooling . . . **Aerojet General Corp,** Azusa, has been awarded a government contract to build a rocket motor for the second stage in shooting an earth satellite into space . . . **McCulloch Motors** is building a $125,000 addition to its engineering building . . . **Northrop Aircraft** has set up a Sub-Contract Relations Dept . . . **Stanford Research Institute** will host a two-day Industrial Economics Conference for West Coast executives in Los Angeles 30-31 . . . **Microloc Corp** has moved to bigger quarters at 5300 W 104th St, Los Angeles.

Elsewhere in the West . . .

Marchant Calculators Inc's new plant at Emeryville, Calif, will cost $4 million, will have 500,000 sq ft. Construction starts in May, will be finished in late 1957 . . . Electronic light appropriately triggered electronic equipment to open the doors of **Minneapolis-Honeywell's** new **Heiland Division** manufacturing plant near Denver. The $1-million, one-story, 45,000-sq-ft plant will make electronic and laboratory equipment . . . **Food Machinery & Chemical Corp,** San Jose, Calif, has a subcontract from **Alco Products Inc** to make $4 million worth of rack suspension systems for medium tanks . . . **Friden Calculating Machine Co,** San Leandro, Calif, has a $682,985 Air Force contract to make special navigation equipment . . . **Varian Associates,** Palo Alto, Calif, has a $454,410 Air Force contract to make electron transmitter tubes . . . **International Business Machines** is calling for bids to build a multi-million-dollar plant near San Jose, Calif. The "campus type" layout will spread over a 190-acre tract . . . **Boeing** has awarded several new subcontracts involving several million dollars in connection with its B-52 jet bomber output.

East...

Eastern newsbriefs . . .

Heppenstall Co, Pittsburgh steel forgings manufacturer, is buying the **Midvale Co,** Philadelphia maker of steel forgings. The combine will become the largest U S maker of heavy steel forgings, and will be known as **Midvale-Heppenstall Co** . . . **Solar Steel Corp** has bought out **United Pipe Column & Railing Co,** Norristown, Pa . . . **Alcoa** reports 1955 was the greatest year in its history —700,000 tons of primary aluminum output. Next year should be even bigger, Alcoa thinks . . . The Brooklyn tool and diemaking firm of **Schneider & Marquard** celebrated its 25th anniversary by foregoing parties and commemorative brochures, instead gave $5000 to be shared by the American Cancer Society and American Heart Association . . . **Techalloy Co,** Rahns, Pa, is spending $250,000 to expand its wire and rod making facilities by 10,000 sq ft . . . **U S Igniter Corp,** Philadelphia spark plug maker, is looking for a new site in the Delaware Valley . . . **Boston & Maine RR** has ordered 1000 freight cars from **Pullman-Standard** . . . **Foxboro Co,** Foxboro, Mass, instrument manufacturer, is doubling the size of its training and education center . . . **Emhart Mfg Co** is acquiring **Maxim Silencer Co,** Hartford, Conn, on a stock-exchange basis . . . **United Engineering & Foundry Co,** Pittsburgh, is thinking about buying the huge government surplus foundry at New Castle, Pa. They're still dickering over price—United is offering $10 million, the government wants $10.5 million . . . **Watson-Stillman Fittings Division of H K Porter Co,** Roselle, N J, is changing its name to **W-S Fittings Division** . . . **Forney's Inc,** New Castle, Pa, has bought out **Barrett Machine Tools** . . . **Rockwell Mfg Co,** Pittsburgh, is planning the biggest expansion program in its history . . . **J L Lucas & Son Inc,** Fairfield, Conn, is celebrating its 50th year of machine tool building . . . **Volkert Stampings Inc,** Queens Village, L I, N Y, has expanded its output 25% with a 12,000-sq-ft addition.

Irwin F Holland (left), has been named special assistant to the manager of Pratt & Whitney's Cutting Tool & Gage Divs. **Edward J Shages** is new divisional factory manager. Mr Holland moves up from his post as general superintendent of the division; Mr Shages has been serving as superintendent of manufacturing for the machinery division

George Gorton III, executive vice president and general manager of the George Gorton Machine Co, Racine, Wis, has been elected president of the company (for additional elections see below)

Names in the News . . .

George Gorton Machine Co elections . . **George Gorton III,** president (see above); **Charles Gorton,** vice president, manufacturing; **James Gorton,** vice president, research and development; **Walter B Tomlinson,** vice president and treasurer; **Howard Holmdohl,** secretary; and **John Elholm, Jr,** assistant secretary.

J C Garrett, president and founder of the Garrett Corp, has been elected chairman of the board, and **W C Whitehead,** executive vice president, has been named president.

E B Suydam, vice president of Linde Air Products Co, a division of Union Carbide and Carbon Corp, has been appointed president of the company. He succeeds **T D Cartledge,** who continues as a vice president of the corporation.

Michael L Kendall has been appointed engineering and maintenance consultant for the Hartford Special Machinery Co in the Detroit area.

Thomas G Bishop, assistant manager of Hydraulic Press Manufacturing Co's eastern office, has been promoted to sales manager of the Plastic Machinery Div.

William E Judd, assistant to the president of Stewart-Warner Corp, has been appointed general manager of the company's US Machine Div. He succeeds **Carl J Winkler, Sr,** who is retiring.

Lawrence J Halderman, Timken Roller Bearing Co executive, has been appointed director of General Components Division of the Business and Defense Services Administration, US Department of Commerce.

Loren C Hurd, formerly associated with the Rohm & Haas Co, has been appointed president of Metals Disintegrating Co, Elizabeth, NJ. **D C Bradley,** assistant to the president in charge of operations, has been named general manager of the company's Pulverizing Machinery Div at Summit, NJ.

Russell W Grabinsky has been appointed assistant superintendent of Taft - Peirce Manufacturing Co's Small Tool & Gage Div.

John C Terry, Jr, formerly associated with General Motors Corp's Allison

Howard P Chace (left), has retired as chief sales engineer of Norton Co's Grinding Machine Div. He is succeeded by **F Kenwood Jones,** associated with the company since 1940

Merrill A Hayden, assistant general manager of Vickers Inc's Waterbury Tool Div, has been named general manager of the division

Paul H Richardson, formerly general manager of the Paragon Gear Works, Taunton, Mass, has been named vice president in charge of engineering for Hartford Special Machinery Co, Hartford, Conn

William F Wolf has been elected vice president and manager of the machine tool division of Harron, Rickard & McCone Co of Southern Calif. Mr Wolf formerly owned the W F Wolf Machinery Co, Los Angeles machine tool distributing firm

Howard J Findley, formerly associated with Eaton Mfg Co, has been elected president of Cleveland Hobbing Machine Co, and a vice president and director of engineering and research for the expanding Fanner Manufacturing Co organization

Engine Div as gage engineering supervisor, has joined Machine Products Corp, Detroit, as chief engineer.

Howard C Jones, former works manager of General Motors Delco Appliance Div, has been named director of manufacturing for Consolidated Electro-dynamics Corp's Consolidated Vacuum Div.

Fred S Gombert, manager of the Conditioned Air Division of Borg-Warner Corp, has been named divisional vice president.

Herman Van Eck, manager of production control for the East Chicago Machine Tool Corp, has been appointed to the newly created position of manager of the firm's Balemaster Manufacturing Div. **John W Rhodes,** formerly associated with the Budd Motor Co, replaces Mr Van Eck.

George R Galbraith has been appointed assistant vice president of the Walworth Co. In addition to his new duties, Mr Galbraith will continue in charge of Walworth marine sales and specialty products for the company.

George G Raymond, Jr, president of the Raymond Corp, has been elected president of The Material Handling Institute. **John W Stiles,** president of Island Equipment Corp, is first vice president; and **R L Fairbank,** sales manager, Towmotor Corp, second vice president.

George B Moseley, former general sales manager of Firestone Steel Products Co, has been appointed vice president in charge of sales for Chase Brass & Copper Co, Inc, a subsidiary of Kennecott Copper Corp.

OBITUARIES

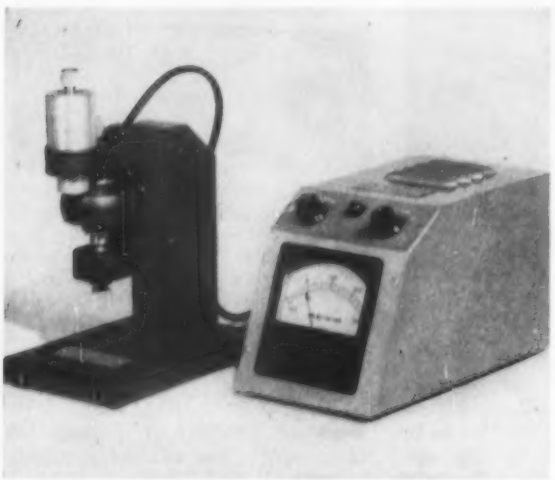
Theodore Trecker, 87, pioneer US machine tool builder and authority on milling, died Dec 21 at his home in Milwaukee. At the time of his death, Mr Trecker was honorary chairman of Kearney & Trecker Corp, Milwaukee, a company he cofounded in 1898 with the late E J Kearney. Mr Trecker was the first president of the company, remaining in that office until his retirement in 1947, at which time he was succeeded by his eldest son, the late Joseph L Trecker. He is survived by three sons and two daughters, one of whom, Francis J Trecker, is president of the company.

Walter H Dreis, 67, president, treasurer and general manager of Dreis and Krump Manufacturing Company, Chicago, died December 8.

Warren C Olson (left), secretary of Besly-Welles Corp, has been promoted to executive vice president. **E Kenneth Welles, Jr,** advertising and sales promotion manager, will, in addition, take over Mr Olson's former duties

Frank E Payne, 72, board chairman and co-founder of Crane Packing Co, Chicago, died Nov 20 in Glencoe, Ill

New Shop Equipment



Non-Contact Comparator Micrometer Measures to 0.000001 in.

Adaptable to a wide variety of dimensional gaging problems, this instrument utilizes the Decker T-42 Ionization Transducer to make capacitive gaging practical. In other words, the gage head makes no contact with the piece to be measured yet the gage is sensitive within a range of 0.000001 to 0.0002 in., according to the manufacturer. The comparator is also available for gaging in the range of 0.005 to 0.0002 in., even on a continuous flow basis. Contact gage heads and adapters are available for inspection operations requiring them. Output from the gaging unit can be used for external control and signalling devices.

Sensitivity of this device is 0.000001 or 0.000010 in. per division; 0.000020 or 0.000200 in. full scale. Gaging limits permitted by the standard unit include: maximum height—8 in.; throat clearance—3⅝ in.; working surface—6 x 6 in.; minimum size of gaged surface—½ in. dia; clearance between gaging head and gaged surface—0.005 in. (approx). Meter provides rapid indication within 1% of error. Power is 120 v, 60 cps and system is fused for ½ amp. While this instrument is designed to measure the mean dimension of a ⅜-to-½-in.-dia circle, single point measurement can be made with a contact gage head, available at slight extra cost, if necessary.

A special development of the standard comparator, the Model 103-5 Rotor Micrometer, measures rotor end play (bearing pre-load) with a sensitivity of 0.000010 in. per div or 0.000050 in. per div. Both of these instruments are designed for shop use.

Decker Aviation Corp, 1361 Frankford Ave, Phila, Penna

NOTE: Decker dynamic balancer was described Dec 5 '55, p194 as utilizing the T-42 Ionization Transducer. Decker informs us that the balancer is the only instrument manufactured by them that *does not* use this device. Actually, sensitive out-of-balance measurement is obtained with a micro-groove phonograph crystal pickup.

Lewis-Shepard Coil Lifters

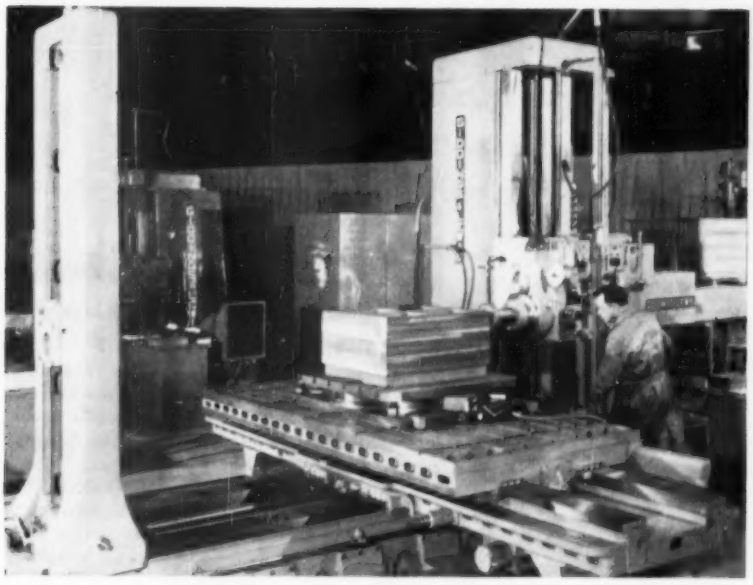
Units, designed for placing coils on slitter mandrels, are equipped with ball-bearing mounted flanged wheels for riding on tracks adjacent to slitter. V-shaped platform is 41½ in. long by 30 in. wide; lowered height is 8 in., vertical lift, 18 in. Lifters can handle coils weighing up to 4000 lb with diameters up to 48 in.

Manually operated unit is equipped with double-acting hand pump requiring 50 strokes for full 18-in. lift. Electro-hydraulic model consists of an electric lift motor, high-pressure 3-piston pump, and hydraulic cylinder.

Lewis-Shepard Products, Dept R-34, Watertown, Mass

MILFORD ATOM-LUBE mist cooling and lubricationg system has an new ⅛-in. nozzle to improve performance and operations requiring light to moderate mist lubricant over small area — ***Henry G Thompson & Son Co, New Haven, Conn***

Materials and Parts . . .



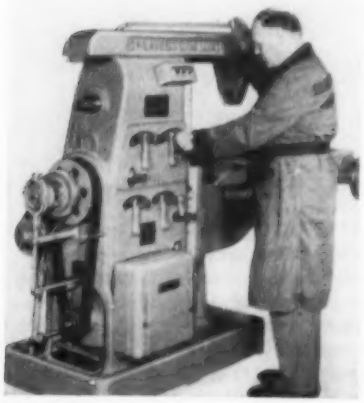
G & L Horizontal Miller Has 48-in. Rotary Table

Model 350-T table-type horizontal boring, drilling, and milling machine is equipped with extended saddle, saddle supports, and over-the-floor auxiliary runways. Unit has a 48-in. air-lift rotary table.

Large diameter boring and facing is accomplished with a 26-in. continuous-feed facing and boring head using telescoping tools. Automatic electric positioning device controls machine table and headstock movements.

"Lubri-Cool" system circulates a continuous supply of refrigerant-cooled lubricant through both headstock and milling feed unit gear trains.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis



Greaves Clutch Control

Clutch control designed as accessory for Greaves horizontal milling machines permits operator to engage and disengage the machine's operating mechanisms while adjusting cutter and table positions and changing speeds and feeds.

Control is mounted on side of the milling machine column and extends forwards within reach of operator. Control lever is mounted in a four-position vertical connection. Clutch itself is multiple-disk type and is mounted on the main drive shaft.

Greaves Machine Tool Div, J A Fay & Egan Co, 2011 Eastern Ave, Cincinnati 2, Ohio

. . . including

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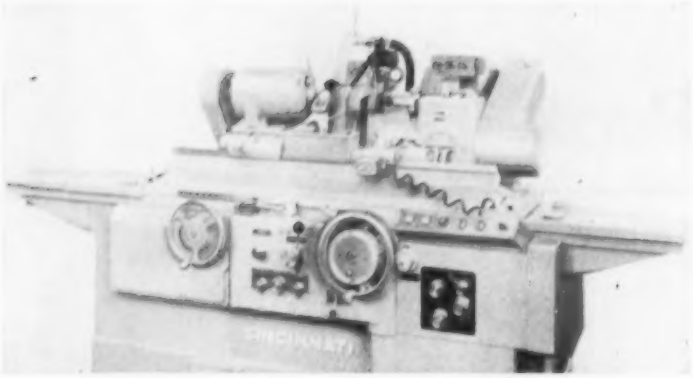


Cincinnati Hydraulic Grinders Have Special Spindle Bearings

Plain hydraulic grinding machines for medium-size parts are designated 6-in.-R (illustrated), 10-in.-L, 10-in.-R, and 14-in. L. Two sizes followed by letter "L" are light types having all the characteristics of the sizes immediately preceding them, but with extra swing capacity to accommodate a flange or projecting arm on the workpiece.

All models have Filmatic bearings for the grinding wheel spindle. Bearings consist of multiple segments, fixed axially but free to rock radially a slight amount. When spindle rotates, wedge-shaped oil films are formed between the segments and spindle diameter, building up to high pressures and automatically adjusting themselves to variations in forces created by the grinding action.

Automatic grinding wheel balancing is included as standard equipment. Wheel can be balanced within 20 sec without removing the wheel mount from the machine. Table traverse on all models is infinitely variable from 3 ipm to 200 ipm.

Headstocks for the 6-R and 10-L machines are powered by a ½-hp ac motor; 10-R and 14-L are powered by a 1-hp ac motor. Speeds range from slightly less than 100 rpm to nearly 300 rpm.

6-R and 10-L machines are built in 18 and 30-in. lengths; 10-R and 14-L units are built in 18, 36, 48, 72, and 96-in. lengths.

Optional equipment includes automatic electric gage sizing with continuous automatic compensation, pushbutton automatic infeed attachment, gap eliminator, and various truing attachments.

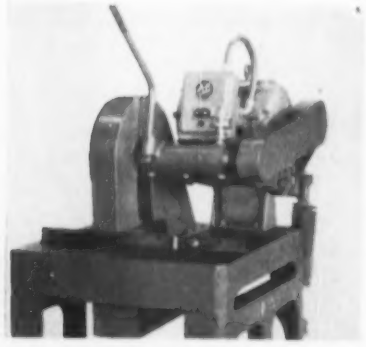
Cincinnati Milling Machine Co, Cincinnati 9, Ohio

Hamilton Eccentric Press Line Has 400 to 4000-ton Units

Line of mechanical presses includes welded-steel, top-drive, full-eccentric-type presses from 400 to 4000-ton capacities. Machines incorporate "Double Lube" pressure-lubrication system, which makes use of troughs and gravity flow to keep all bearings lubricated even if the pressure and flow switches used in a standard pressure lubrication system should fail.

Air clutch on units is a low-inertia type which is mechanically interlocked, does not depend on the timing of valves and switches to prevent overlap. Low-inertia design allows for clutching and de-clutching at speeds almost equal to the continuous speed of the press. Clutch can also be inched at low torque when dies are being set.

Baldwin-Lima-Hamilton Corp, Hamilton, Ohio



Tabor Cutoff Machine Takes 2-in. Tubing

Model designated Comet is addition to line of Tabor-Brasive cutoff machines. The 5-hp unit handles steel bar-stock in 1-in.-dia rounds or 2-in.-dia, ⅛-in.-wall tubing.

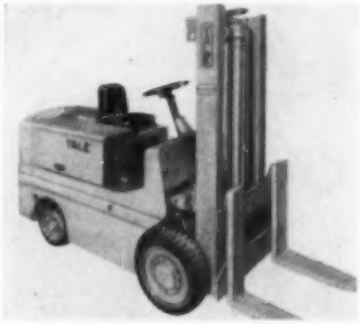
Machine incorporates special shim-adjusted Timken bearing-mounted spindle and trunnion, by means of which end play can be eliminated. Fan-cooled motor is totally enclosed and adjustably mounted for proper drive belt tension.

Cutting wheel has a pivoted side cover in its guard, for inspection or rapid wheel replacement. Adjustable spring counterbalance is provided to ease wheel "chopping" operation.

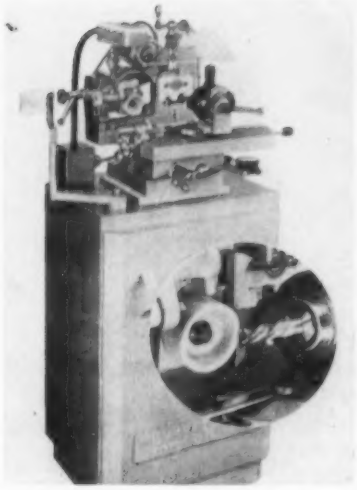
Tabor Mfg Co. Div of Turbo Machine Co, Lansdale, Pa

Rubber sheet packing for every industrial application is available in a complete range of grades and types of pure gum and synthetic rubber. Sheet stock is furnished in standard 36 and 42-in. rolls in thicknesses from 1/16 in.

Quality Rubber & Transmission Co, 2203 W Chicago Ave, Chicago 22, Ill



LIFT TRUCKS, KGA51 series in 3000 to 8000-lb capacity, are equipped with Yale Torque transmission providing fully automatic gear shifting. Inching control and added visibility are additional features — *Yale & Towne Manufacturing Co, 11000 Roosevelt Blvd, Philadelphia 15, Penna*

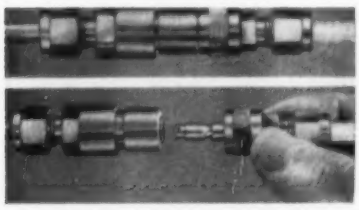


End Mill Grinder Has Fast Setup Time

Centra-Point grinder is said to incorporate a simplified method for processing helical cutters. Simple adjustments set up the machine for work in 70% less time than required with conventional grinders, according to the manufacturer. Clearance angles can be read directly from calibrations on wheel-head assembly without reference to tables of constants. Mechanical wheel dressing by built-in diamond truing tools is said to insure perfect wheel radius for helical grinding.

Specifications are collet capacity up to ¾-in.-dia; diameter of largest cutter accommodated, 3 in.; diameter of grinding wheels, 2 in.; grinding wheel speed, 6900 rpm.

William H Field, Inc, 325 Dorchester Ave, Boston 27, Mass

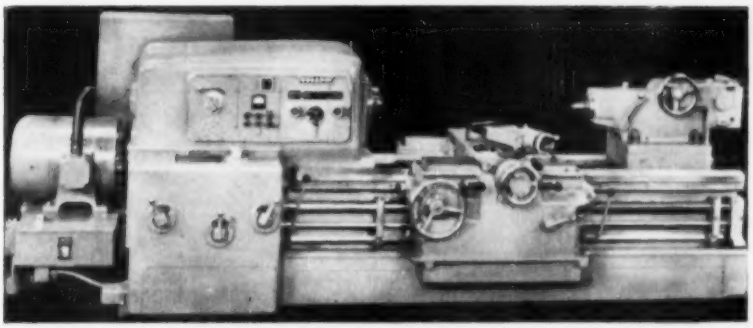


Swagelok Quick Connect Fitting

Fitting incorporates shutoff valve that acts as a positive seal to prevent any leakage during connecting or disconnecting (accomplished by thumb and finger). Internal design is said to permit freer flow than is possible with fittings of similar type.

Available in all metals in three types: tube to tube with Swagelok ends; tube to pipe with one end; bulkhead, either tube to tube or tube to pipe.

Crawford Fitting Co, 884 E 140th St, Cleveland 10, Ohio



Monarch Series 80 Lathe Offered in Four Models

Heavy-duty engine lathe, designated Series 80 and engineered for high-production turning, boring, and facing of large workpieces, is available in four models. Units are equipped with Dyna-Shift headstock and can provide automatic calculation of spindle speed to produce the desired surface speed on the workpiece.

The 36 different spindle speeds—from 8 to 1000 rpm on models 2000 and 2001, and from 10 to 1250 rpm on models 1600 and 1601—satisfy a wide variety of job requirements.

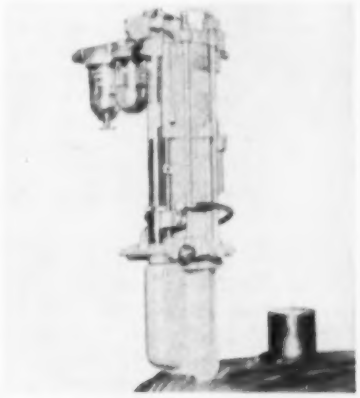
Dyna-Shift headstock has two large dials, one for setting work diameter to be turned, the other for setting the desired surface cutting speed. All electrical controls are grouped at front of headstock within easy reach of operator.

Each Series 80 lathe is equipped with a main drive motor capable of 45 hp. Lubrication of all headstock gears and bearings is by means of a high-pressure mist and spray system. Gear box provides a range of 48 commonly-used threads and gears, with a range of threads per inch from ½ to 28 and a range of feeds per revolution from 0.003 to 0.168 in.

Models 1600, 1601, 2000, and 2001 are designed to provide clearance diameters of 25, 30, 32, and 36 in. respectively. All models are available in standard lengths ranging from 48 to 240 in. between.

Other features: apron equipped with 4-way hydraulic power rapid traverse; two-speed feature on tailstock for rapid or slow spindle movement.

Monarch Machine Tool Co, Sidney, Ohio

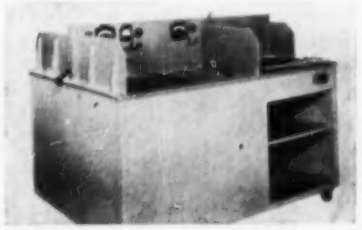


Drill Feed Converts Drillpress Into High-Production Automatic

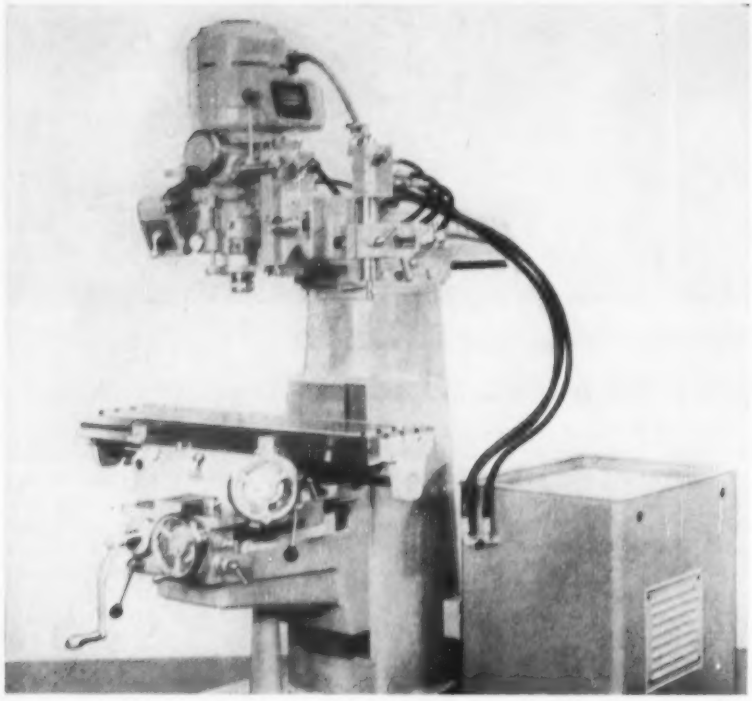
Work cycle of air-operated, hydraulically controlled drill feed is started by foot pedal. Three control knobs adjust all operations.

Fast approach is set by dial to any length from zero to 4 in.; drilling depth is controlled by micrometer-type dial to an accuracy of ± 0.002. Dial set feed valve adjusts drilling speed to any material hardness. Absence of electrical devices insures safety when working near volatile material. Unit does not interfere with manual operation of drillpress.

General-Pacific Corp, 8740 Washington Blvd, Culver City, Calif



PROTOMAKA, for making production prototypes of printed electronic circuits, can turn out an average circuit in 30 to 40 minutes. Sizes up to 12 x 16 in. can be manufactured. Unit is 60 in. long by 50 wide by 45½ high—
Printed Electronics Corp, 7 North Ave, Natick, Mass



Cincinnati Millers Handle Contoured Shapes

Contourmaster is designation for tool and die milling machine designed for production of small dies and molds. Basic field of operation is in the production of contoured shapes such as plastic molds, die-casting dies, forging dies, master hobs, and glass molds.

Machine is of knee-and-column structure, with column truncated to provide a turret-like swivel mount for the cross-sliding ram which carries the spindle head.

Features include automatic hydraulic depth tracer, anti-friction hand feed screws, micrometer depth gage, and front-table hand control.

Machine is supplied in two styles: 1A has 16-in. table travel, Acme-type screws for table and saddle, and table feed handwheels at each end of the table; 1B has 22-in. table travel, anti-friction ball-bearing lead screws and nuts, and front-table control handwheel.

Eight spindle speeds are supplied, ranging from 215 to 5650 rpm. Spindle nose is of the collet chuck type, and collets are available for ¼ to ¾-in. diameter straight-shank cutters, Nos. 5 and 7 B&S tapers, and Nos. 1 and 2 Morse tapers.

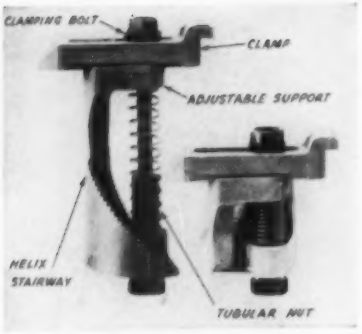
Cincinnati Milling Machine Co, Cincinnati 9, Ohio

Special Precision Mandrel Lowers Production Costs

This 5/16-in. special miniature mandrel was designed to supply a rugged and accurate means of holding and locating a precision aircraft part for semi-automatic finish-grinding to a shoulder.

Le Count's Count-Centric hand-manipulation feature, which eliminates need of an arbor press, 1/32-in. expansion, and a stop for positive location reportedly facilitate handling, speed operation, and cut overall production costs.

Le Count Tool Works, Inc, 390 Capitol Ave, Hartford, Conn



Deckel Universal Clamp Is Helix-Type Holder

Deckel universal work clamp (shown in highest and lowest positions) is designed to hold all types of workpieces. Design is said to eliminate separate work clamps, blocks, bolts, nuts, and washers.

When adjustable support is moved, work clamp can be moved to any desired height along the helical "stairway," which consists of small steps extending around the axis of the clamping bolt. Slotted, adjustable work clamp is fitted into a groove on top of the support.

Eleven different sizes are available, up to a maximum clamping height of 12⅝ in.

Cosa Corp, 405 Lexington Ave, New York 17, NY

Conversion Unit for Drivmatic Riveters

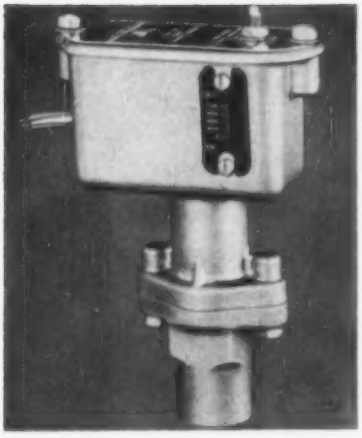
Huck and Hi-Shear conversion unit for standard Drivmatic automatic drill riveting machines is package which replaces the entire lower ram. Lower ram tooling for handling high strength fastenments is quickly interchangeable and consists of anvil and snap in collar magazines.

Unit provides a clear opening between anvils of 8 in., which is 2½ in. more than that provided with standard Drivmatic, facilitating the fabrication of deeper sections.

General Riveters, Inc, 785 Hertel Ave, Buffalo 7, NY

Ceramic pins and bushings, called Sur-Braze HT-1, are available for supporting or jigging parts and assemblies for high-temperature furnace and induction brazing work. Material is high-temperature refractory suitable for operating temperatures up to 2200F. It is reported that fluxes, silver, and copper brazing alloys will not wet the ceramic, so that assembly sticks to the fixture. Max diameter available is 3 in.

Technion Design & Mfg Co, 262 Mott St, New York 12, NY



Switch is Set Without Gages

Switch C9612 has a calibrated plate permitting visual setting before or after installation on a pressure line. Tamperproof indicator is visible through a window in the plate. External adjustment screw lines up indicator with desired pressure on plate. Once set, screw can be locked in place.

Unit accurately senses any system pressure over an adjustable range of 15 to 3000 psi; particular range may be covered by one of four classes of switch. Fixed actuation value varies from 10 to 250 psi, depending on setting. Sensing element is piston-type.

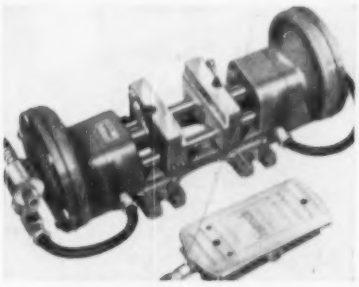
Barksdale Valves, 5125 Alcoa Ave, Los Angeles 58, Calif

Vertical Broaching Machine Has Unobstructed Worktable

Model VT830 for heavy-duty internal or surface broaching has a 22-in.-sq worktable clear of visual obstructions, permitting almost unlimited range in size of work, or broaching fixture.

Pull head is said to be easily aligned by screw slide adjustment to precision central relationship with 5-in. dia-faceplate mounting hole in table. Hydraulic machine, available in 6 or 8-ton models, has adjustable stroke up to 30 in. Variable cutting speeds up to 23 fpm, with return speed to 70 fpm provide sufficient range for high production requirements. Positive mechanical control lever is located at normal hand-rest position. Unit is 58 in. high; floor space is 22 x 43 in; powered by self-contained hydraulic power unit.

Pioneer Broach Co, 6434 E Telegraph Rd, Los Angeles 22, Calif



Heinrich Air Vise Is Self-Centering

Model 22 air vise is designed for holding parts varying in size or shape when the work requires the location of a center or other predetermined point. Each of the two opposing jaws is actuated directly by an air cylinder on both sides of the vise. Movement of the jaws is synchronized within a tolerance of 0.001 in. by a gear and rack concealed within the body casting.

Air cylinders are constructed of die-cast aluminum and have neoprene diaphragms. 4-in. vise jaws have a maximum travel of ⅜ in. for each jaw, for a total of ¾ in. for both. Jaws are infinitely adjustable to 4½-in. opening.

Total pressure exerted by both cylinders on work is approximately 3000 lb at 100 psi.

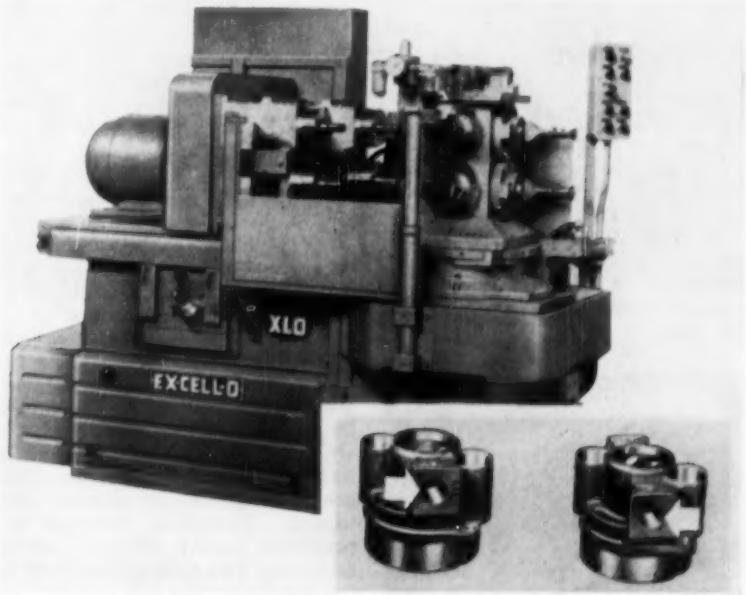
Heinrich Tools, Inc, Racine, Wis

Diamond Tool Line Machines To High Finish, Close Tolerance

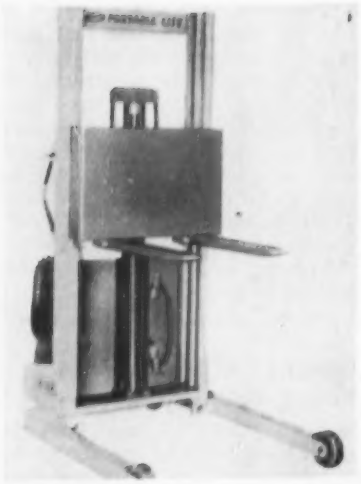
Hamilton Watch has introduced diamond tools designed for machining to extremely close tolerances (ten-thousandths of an inch), and for producing a machined surface so smooth that polishing or other finishing is not required.

Line includes turning tools for cutoff and for finish-turning of flat or bevelled surfaces; laps for machining inside surfaces of holes to achieve precise diameter and very fine finish, available in sizes from 0.018-in. to 2.250-in.-dia; and a variety of wheels and disks for precision external machining.

Hamilton Watch Co, Allied Products Div, Lancaster, Penna



CAST-IRON COMPRESSOR CRANKCASES for refrigeration equipment are machined on Ex-Cell-O Style 54 one-way boring machine. Using 4-station indexing fixture, machine bores, counterbores, and chamfers two offset, opposing cylinders (shown in inset). Cycles are fully automatic except for loading and unloading. Unit can be combined with similar machines for automation operations—*Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich*



Oster Hydraulic Lift Is Manually Propelled

Multi-purpose hand-or-battery-powered hydraulic lift is designed for handling and stacking heavy loads with one operator. Manually propelled lift has a 2000-lb capacity.

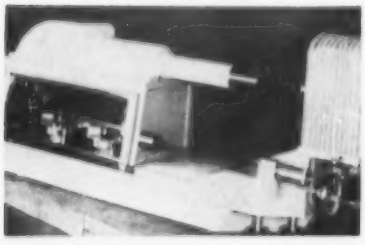
Carrier legs are adjustable to permit legs to ride straddling the load or beneath the load. Built-in charger and remote control device are included as standard equipment on battery-powered models.

Specifications: lift range, 2 to 56 in.; turning radius, 60 in.; platform dimensions, 28 x 28 in; over-all height, 78¼ in; over-all length, 52 in. Other specifications can be provided.

Oster Mfg Co, East 289th St, Wickliffe (Cleveland), Ohio

Packaged Flats are vibration-dampening machinery mounts consisting of one 9 x 18 in. sheet of Air-Loc machinery mounting material and one sheet of Air-Loc SL shim holding material. Package is said to be enough to mount from 1 to 3 machines. Cost, $11.64 FOB Franklin, Mass.

Clark, Cutler, McDermott Co, Franklin, Mass

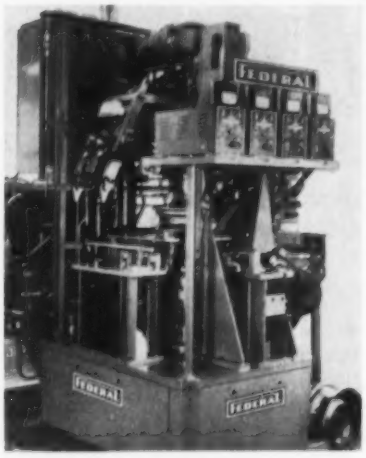


Gage Block Interferometer

Interferometer for absolute measurement of gage blocks to an accuracy of one millionth of an inch is now available. The NPL-Hilger instrument, designed and developed by the English Standards Institution, can accommodate 36 blocks simultaneously in a temperature-insulated case. Measurement can be made in a choice of the best radiations from varying light sources; length, as well as flatness and parallelism of faces is determined.

As gages are measured in the condition in which they are used—wrung onto a platen—special compensating calculations are unnecessary.

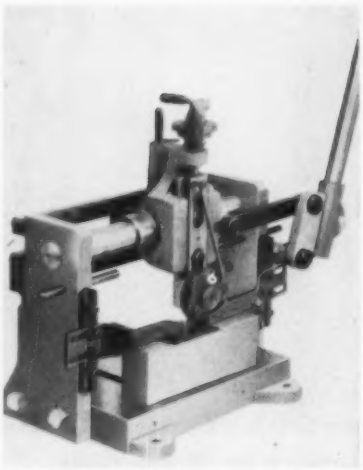
Distributed by Engis Equipment Co, 431 S Dearborn St, Chicago 5, Ill



TUBELESS TIRE WHEELS are checked for radial and lateral runout by Federal gage, which directs all rejects out of continuous line, passes all good wheels onto conveyor which carries them to next operation. Special operation employs two gages in split line which produces wheels at rate of approximately 900 per hour. Gage measures runout by clamping wheel by its five bolt holes with a pressure of 1000 lb per hole and rotating it. While wheel is rotating, gage contacts move in and measure runout, transmitting electronic signals to 4-station classifier which passes or rejects wheel — *Federal Products Corp. 1144 Eddy St, Providence 1, RI*

Diamond impregnated tools designed for dressing thread-grinding wheels are available in all types of holders for thread-grinding machines that grind sharp "V" or straight line threads. Protruding diamond impregnated matrix offers a cutting face in any direction. Matrix extends beyond actual tool end, so that less cold roll steel is in contact with the grinding wheel. Tools can be reconditioned by grinding face with a GC 80-18 Vw carborundum wheel.

Diamond Products, Inc, 332 Prospect Ave, Elyria, Ohio



Bench-Mounted Marking Unit For Light-Duty Operation

Manually operated Model 27 uses either roller dies for marking flat parts, or flat-roll dies for round parts; will indent one line of characters ⅛ in. or smaller on parts of suitable size, shape, and workability. It is also available with bat-roll holders or mortised roller dies for quick, interchangeable marking with Matthews steel type.

Downward pull of handle marks part; dies are returned to starting position by raising handle. Max throat opening is 3½ in., with 1½-in. min; die stroke on round or flat parts is 1½ in.; bench space, 16 x 10 in.

Jas H Matthews & Co, 3982 Forbes St, Pittsburgh 13, Penna

Epon Curing Agent T, a low-viscosity, high-boiling liquid, has been developed for use in room temperature contact pressure laminating, especially in the tooling field. Low viscosity is said to result in better wetting out of glass cloth and stronger laminates than can be obtained with previously available room temperature curing agents.

Shell Chemical Corp, 50 W 50th St, New York 20, NY

Controlled-volume pump for downhill pumping is designed for accurate metering of flow of liquids or gases against negative discharge pressure. Suction pressures are required to be held (mechanically or naturally) at least 5 psi above discharge pressures. Available in 4 sizes, of about 3, 15, 75, and 375 ml per cycle. Capacity is manually or automatically adjustable during operation, through either stroke length or speed control. Constructed of 316 stainless with neoprene or Tygon trim.

Milton Roy Co, Station L, 1300 E Mermaid Lane, Philadelphia 18, Penna

Full of sound and fury, signifying PLENTY

7,700-s.f.p.m. wheel speed is "stopped" by 1/10,000 sec. stroboscopic exposure. (Wheel guard opened and coolant flow reduced to reveal cutting action.)

The *right* Abrasive Cut-Off Wheel by CARBORUNDUM will slice through metal in seconds...12 to 20 times faster than a power hacksaw. You get clean, accurate cuts, without extra deburring and smoothing needed after shearing or flame-cutting. For wet cutting, to extremely close tolerances, use Rubber Bond Wheels...for dry cutting at high speeds, use Resinoid Bond. Tough CARBOFLEX Reinforced Wheels are tops for all portable cutting and slotting—combine fast action with maximum safety. Your CARBORUNDUM Distributor or salesman knows how to help you use abrasive cutting, profitably, in your shop. Call him today. For free Booklet #6, "Metallic Cutting Off," write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

Through application "know-how" and product quality

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REGISTERED TRADE MARK

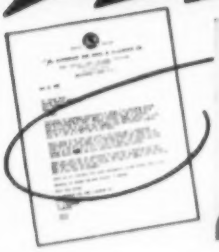
continually puts more sense in your abrasive dollar

PORTAGE offers 10 MINUTE change over time

FROM BORING, MILLING, DRILLING to DUPLICATING

...all in ONE machine...from ONE source

Boring, Drilling, Milling and Duplicating operations all done in one set up
. . . one machine . . . one operator, no loss of change over time.



→ *Read What One User Has to Say!*

Portage Machine Company
1025 Sweitzer Avenue
Akron 11, Ohio

Gentlemen:

Before going in for this type setup, I completely investigated all other types of contouring machines and found that we could be a lot more universal with the Portage Boring Mill and Turchan Hydraulic Follower because we can accurately bore a series of holes, mill pockets and also outside bosses, where the other machines would only contour.

Today more than ever the die business is becoming more and more complicated due to the irregular shapes and designs of these stampings, and I don't see how any Tool and Die Shop can compete without having this type of equipment.

Yours very truly,
P. J. Holstein
THE SUPERIOR DIE, TOOL & MACHINE CO.

PORTAGE

THE PORTAGE MACHINE CO.

1026 Sweitzer Avenue • Akron 11, Ohio

Representatives in Principal Cities

BUILDERS OF PRECISION MACHINE TOOLS, SPECIAL AND PRODUCTION MACHINERY SINCE 1916

FYI

FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI – these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 INCLINABLE PRESSES—*E W Bliss Co, Canton, Ohio.* 32-page catalog 2D illustrates and describes line from 10 to 200 ton standard and enclosed design. Special features, attachments, dimensions covered.

2 DOUBLE DISK GRINDER—*Gardner Machine Co, Beloit, Wis.* 8-page catalog 2V-55 describes Model 2V18 precision unit for generating parallel and flat surfaces on variety of small parts. Design features illustrated, specifications provided.

3 MULTI-SLIDE MACHINES — *US Tool Co, Ampere, NJ.* 9-page illustrated bulletin 15 contains data on units for production of stampings. Includes applications, principles of operation, design features, tooling specifications; auxiliary equipment included.

4 CYLINDRICAL GRINDING MACHINES—*Landis Tool Co, Waynesboro, Penna.* 20-page booklet includes illustrated descriptions of integrated production lines, automatic grinders and standard machines.

5 DUPLEX VERTICAL BORING MACHINE—*Ex-Cell-O Corp, Detroit 32, Mich.* Bulletin 31356 gives specifications, operating data, illustrated description of Model 432 Duplex designed for precision machining of parts chucked on vertical spindles. Boring, facing, grooving, and chamfering can be performed singly, or in any combination.

6 TRIPLE ACTION PRESSES — *Baldwin-Lima-Hamilton Corp, Hamilton Press Div, Hamilton, Ohio.* 8-page folder presents illustrated description of units. Features and specifications covered.

7 ELECTRIC GRINDING & DRILLING EQUIPMENT—*Dumore Precision Tools, Racine, Wis.* 40-page catalog 55-FL covers line of toolpost grinders, hand grinders, automatic drilling units, drill grinders and accessories. Applications illustrated, calculation charts for proper accessory selection included.

8 MULTI-SPINDLE DRILL-TAPPER —*Cleveland Tapping Machine Co, Canton 6, Ohio.* 4-page folder illustrates the Cleveland Jr; drills up to 8 holes (No. 25) in mild steel, taps up to 8 (10-32). Capacities, automatic operational details; specifications.

● POWER SAWING HANDBOOK—*The DoAll Co, 254 N Laurel Ave, Des Plaines, Ill.* 108-page book contains summary of present cutoff methods and chapter on costs. Automatic power saw with HSS saw band described. Characteristics of commercial steels and recommendations for cutting included. Request direct on company letterhead.

9 TESTING & BALANCING EQUIPMENT—*Tinius Olsen Testing Machine Co, Willow Grove, Penna.* 25-page 75th anniversary bulletin traces development of modern testing and balancing machines. The 60,000-lb capacity De Luxe Super L is illustrated with instruments and accessories; new Selectorange indicating system explained.

TOOLS AND ACCESSORIES

● CARBIDE TOOLS — *Union Twist Drill Co, Dept CNR, Athol, Mass.* 64-page illustrated catalog CC contains listings, specifications, and technical data on recent developments and additions to line of drills and cutting tools. Request direct on company letterhead.

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FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 INCLINABLE PRESSES—*E W Bliss Co, Canton, Ohio.* 32-page catalog 2D illustrates and describes line from 10 to 200 ton standard and enclosed design. Special features, attachments, dimensions covered.

2 DOUBLE DISK GRINDER—*Gardner Machine Co, Beloit, Wis.* 8-page catalog 2V-55 describes Model 2V18 precision unit for generating parallel and flat surfaces on variety of small parts. Design features illustrated, specifications provided.

3 MULTI-SLIDE MACHINES — *US Tool Co, Ampere, NJ.* 9-page illustrated bulletin 15 contains data on units for production of stampings. Includes applications, principles of operation, design features, tooling specifications; auxiliary equipment included.

4 CYLINDRICAL GRINDING MACHINES—*Landis Tool Co, Waynesboro, Penna.* 20-page booklet includes illustrated descriptions of integrated production lines, automatic grinders and standard machines.

5 DUPLEX VERTICAL BORING MACHINE—*Ex-Cell-O Corp, Detroit 32, Mich.* Bulletin 31356 gives specifications, operating data, illustrated description of Model 432 Duplex designed for precision machining of parts chucked on vertical spindles. Boring, facing, grooving, and chamfering can be performed singly, or in any combination.

6 TRIPLE ACTION PRESSES — *Baldwin-Lima-Hamilton Corp, Hamilton Press Div, Hamilton, Ohio.* 3-page folder presents illustrated description of units. Features and specifications covered.

7 ELECTRIC GRINDING & DRILLING EQUIPMENT—*Dumore Precision Tools, Racine, Wis.* 40-page catalog 55-FL covers line of toolpost grinders, hand grinders, automatic drilling units, drill grinders and accessories. Applications illustrated, calculation charts for proper accessory selection included.

8 MULTI-SPINDLE DRILL-TAPPER —*Cleveland Tapping Machine Co, Canton 8, Ohio.* 4-page folder illustrates the Cleveland Jr; drills up to 8 holes (No. 25) in mild steel, taps up to 8 (10-32). Capacities, automatic operational details; specifications.

● POWER SAWING HANDBOOK—*The DoAll Co, 254 N Laurel Ave, Des Plaines, Ill.* 108-page book contains summary of present cutoff methods and chapter on costs. Automatic power saw with HSS saw band described. Characteristics of commercial steels and recommendations for cutting included. Request direct on company letterhead.

9 TESTING & BALANCING EQUIPMENT—*Tinius Olsen Testing Machine Co, Willow Grove, Penna.* 25-page 75th anniversary bulletin traces development of modern testing and balancing machines. The 60,000-lb capacity De Luxe Super L is illustrated with instruments and accessories; new Selectorange indicating system explained.

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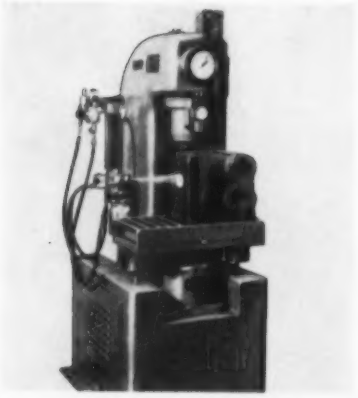


Hardness Tester Uses Paint Spray Device for Sorting

Steel City Brinell hardness tester is designed to fit into roller conveyor supplied by the customer. Instrument has paint spray attachment synchronized with testing cycle of the machine, so that relative hardness of parts is indicated by a spot of paint.

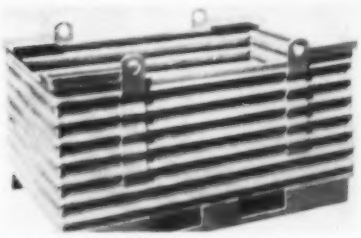
Part to be tested rests on three hardened anvils. Brinell impression is made by hydraulic action, and if the part is acceptable, a spot of paint is automatically sprayed onto it. Parts not sprayed after testing are rejected.

Brinell limits on the machine are adjustable in accordance with user's requirements. Models are available with adjustable openings to handle a variety of work.

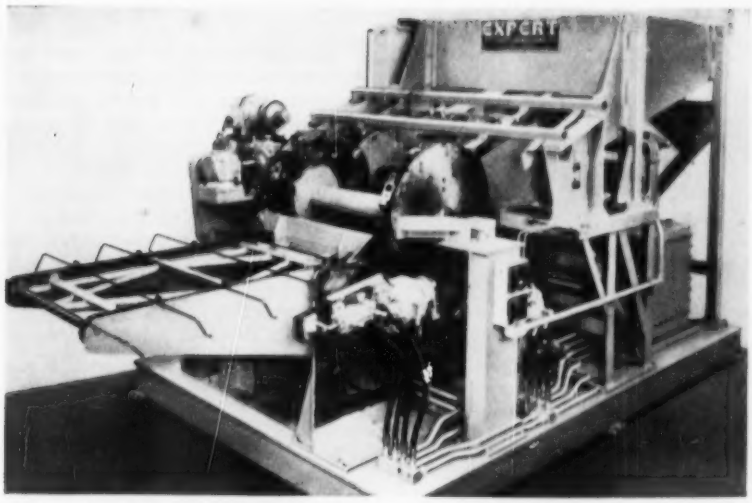
Steel City Testing Machines Inc, 8817 Lyndon Ave, Detroit 38, Mich

Foto-Notes provide rapid filing and answering system for inter-company correspondence. Letters to be answered are photo-copied with Transcopy unit, and answer is written directly on copy of original, so that one copy does the work of two.

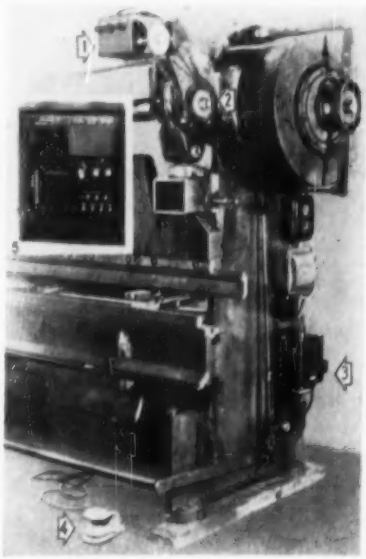
Remington Rand Div, Sperry Rand Corp, 315 Fourth Ave, New York 10



CORRUGATED ALL-STEEL SKID BOXES have square corners to prevent sliding, reinforced rolled edges and lapped seams for greater strength. Built to customer specifications—*Palmer Shile Co, 16019 Fullerton, Detroit 27, Mich*



AUTOMATIC BENDING MACHINE produces up to two bends in each end of steel rods at rates up to 960 per hour. Machine has a mechanically-operated rotary index drum that indexes rods from a feed chute to two bending stations. Bends are produced by dies powered by hydraulic rotary actuators, which are adjustably mounted to produce wide variety of bend angles — *Expert Automation Machine Co, 17144 Mt Elliott Ave, Detroit 12, Mich*



AAC Press Brake Control Eliminates Whipping, Kinking

Automatic control can be installed on any press brake, according to manufacturer. Control consists of four components, as shown above: limit switch box tied in with stroke of ram (1,2); solenoid (3); foot switch (4); and control panel (5).

Device is reported to provide faster and safer press brake operations, as well as the elimination of kinking or whipping of sheets.

Features include preset stop, which automatically stops ram at any point in the down stroke; self return, which automatically returns ram to the top of its stroke; and non-repeat, which prevents press brake from repeating.

Hand buttons can be used instead of foot switch. Settings may be arranged so that hand-button control brings ram down to preset stop; pulsing begins and continues until the bend is made, and then the foot switch causes the ram to complete its cycle.

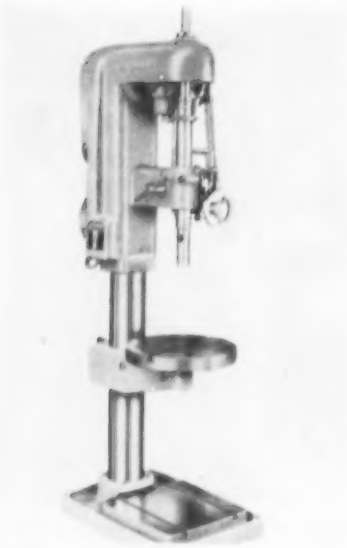
American Actuator Corp, 219 E 44th St, New York 17, NY

Device Measures Runout

The Optron measures displacement, runout, or vibration of oscillating or rotating parts from 1 mu-in. to 5 in. with frequency response from zero to 100,000 cycles per second. Works on any size, shape, or composition of material. No special setup procedures are required.

Unit may be used to measure amplitude and frequency of reciprocating parts such as pistons, valves, cam followers, or measure runout of rotating shafts, cylinders, flywheels, or any moving part without making contact. Any motion in any plane may be accurately measured, according to the manufacturer, and displayed on a conventional oscilloscope or recorded on an oscillograph, since output signal is on the order of 100 to 300 v.

The Optronic Co, 136 Caputo Lane, San Jose, Calif



Cincinnati Floor Drill Has Stationary Head

Model LO is 21-in. stationary head floor drill rated at 1½ in. in cast iron with a 1-hp, 1800-rpm motor. Drill is shipped complete with motor and controls, is ready to operate as soon as power leads are connected to the factory-installed electrical controls built into the head.

Drill is supplied with power feed as standard equipment, in addition to hand lever and handwheel feeds. Simple selector gives any of four rates of feed. Depth gage incorporating a positive stop is provided to disengage feed automatically.

No. 4 Morse taper spindle is mounted in heavy-duty ball bearings. 8 spindle speeds range from 23 to 400 rpm. No wrenches are required to change spindle speeds.

Round, 17-in. dia, T-slotted table is provided. Table rotates 360° on a pinion and may be locked in place with a lever.

Cincinnati Lathe and Tool Co, Cincinnati 9, Ohio

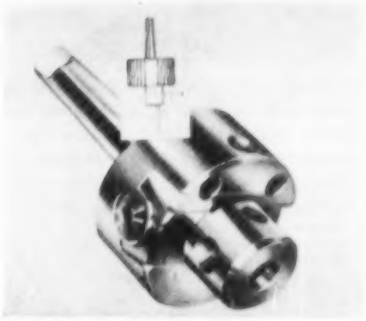
Weldmobile Redesigned For Improved Mobility

Weldmobile is a self-contained, self-propelled welding unit with engine directly coupled to the generator. Since its towng capacity is rated at 2000 lb drawbar pull, it can tow other equipment or material to the job.

Larger wheels in the rear, with ground-gripper tires, implement-type tires in front, and greatly increased ground clearance at both axles have reportedly improved its mobility over that of previous models.

The 400-amp model is powered by a Chrysler 6-cylinder industrial engine; the 600-amp by a Chrysler V8-cylinder. Two wells and brackets are located at the rear for acetylene and oxygen tanks.

Hobart Brothers Co, Hobart Square, Troy, Ohio



Offset Boring Head

Model 43-B, with ⅝-in. bar capacity, offers both perpendicular and parallel holding of tools. Body is 2¾ in. in diameter; tool block extension is also round.

Unit has built-in micrometer adjusting tool block offset to ⅝ in. in increments of 0.001 in., with 0.050 in. to a turn for speed of setting.

Flynn Manufacturing Co, 133 Flowerdale, Ferndale 20, Mich

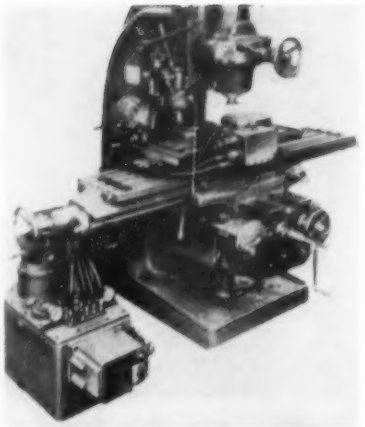
Manual Tube Bender

Exactol, a crank-operated, worm gear device, handles annealed or ⅛H cold drawn stainless steel tubing.

Operating mechanism consists of one-piece frame with bronze worm wheel and hardened steel worm with ratio of 60:1, supported with prelubricated ball bearings and ball-type thrust bearing. Bends up to 180° can be produced in one continuous operation.

Side block has grooves for tube sizes: ¼, 5/16, ⅜, ½, and ¾-in. OD. Each radius block has graduated marking to indicate degree of bend. Unit can be clamped in a bench vise, or mounted in an adapter fastened to a work bench, or to a mandrel support base. Details in catalog 1141A12.

Parker Appliance Co, 17325 Euclid Ave, Cleveland 12, Ohio



Cam Milling Fixture

Wickman-Hayes Cammaster is automatic self-contained fixture for the 360° copy milling of cams. Unit can be used with any vertical milling machine of suitable capacity.

Fixture consists of a base on which slides a table carrying two rotary tables. Table traverses on base of a hydraulic cylinder; rotary tables are driven by a hydraulic motor through worm and worm wheel and spur gear reduction drive. At rear of fixture is mounted a vertical arm carrying combined slides which support the tracing unit.

Tracer valve automatically controls speed of rotation of tables as well as copying movement. Tables are rotated at varying speeds which approximate a consistent rate of feed relative to the contour.

Wickman Products Corp, 10325 Capital Ave, Oak Park, Detroit 37, Mich

Magic Marker writes on paper, cloth, glass, wood, plastics, aluminum wrap, metals, and other materials. Writes with felt nib, in variable line widths. Available in six colors, plus brown, black, and white. Original supply is 48,000-in. ink line, with refills available for $0.25 each.

Speedry Products, Inc, Richmond Hill, NY

Remington Rand Alphabetical Tabulator translates punched card information into printed form, with net; great, great grand; and progressive totals. Adds and subtracts figures, multiplies by repetitive addition, retains up to 60 columns of variable data, and will print up to 6,000 lines per hr, with 100 printing positions on every line, and 37 type characters for every position.

Bulletin TM-923.

Remington Rand Div of Sperry Rand Corp, 315 Fourth Ave, New York 10

Up to 40% higher tightening torques — a feature of new High-Torque Unbrako socket set screws

RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES (Inch-Pounds)

SCREW SIZE	UNBRAKO	SET SCREW B	SET SCREW C	MINIMUM DIFFERENTIAL %
#4	5	3.9	3.5	28
#5	9	7.8	7.4	15
#6	9	7.8	7.4	15
#8	20	14.7	14.5	36
#10	33	26.5	25	25
1/4	87	62	60	40
5/16	165	122	125	32
3/8	290	198	225	29
7/16	430	309	350	23
1/2	620	460	500	24
5/8	1225	1106	1060	11
3/4	2125	1540	1800	18
7/8	5000	3660	4600	9
1	7000	5025	6500	8

Compare UNBRAKO-recommended tightening torques with those of ordinary socket set screws and you readily see why you can set an UNBRAKO and then forget it. The reasons are simple. UNBRAKOS have deeper sockets, which give you better purchase with the wrench; rounded socket corners, which eliminate the sharp corners where cracks start; fully formed threads, which make them stronger; and knurled cup points, which keep them tight.

Let's see just how the development of fully formed threads make the new High-Torque UNBRAKO stronger. The metal is compressed into the closely knit grain structure that you see in the illustration. The grain flow follows the contour of the threads. There are no straight lines along which shear can occur. An UNBRAKO retains its flow lines even when ground down to .010" below root diameter. Conversely, cut or ground threads have straight flow lines—lose thread form at root diameter.

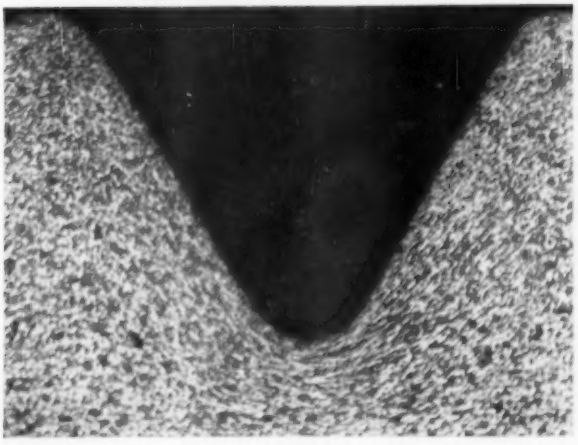
You can't buy a better screw than an UNBRAKO. And you can't get full *high-torque* performance without a "High-Titan" UNBRAKO Hex Key—the high-ductility, precision internal wrenching tool. See your authorized distributor today. Or write STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

STANDARD PRESSED STEEL CO.

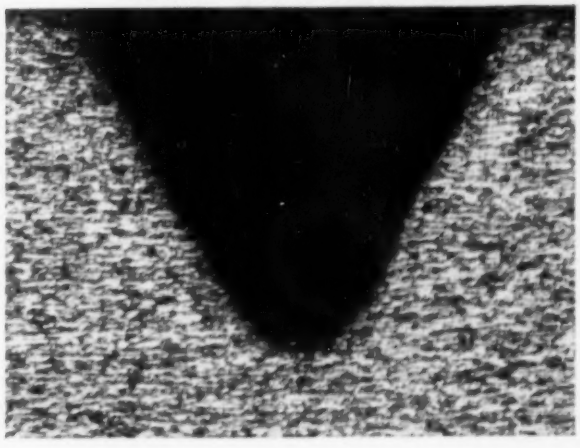
UNBRAKO® SOCKET SCREW DIVISION SPS

JENKINTOWN PENNSYLVANIA

UNBRAKO SET SCREW THREADS



ORDINARY SET SCREW THREADS

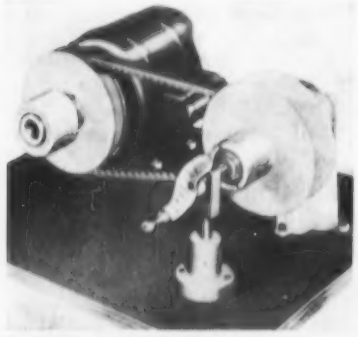


Winslow Spacematic Drill Motor

Air-powered hand tool is designed for drilling and countersinking close tolerance holes in a single operation. Changeable spacing feet are claimed to assure holes drilled to accurate spacing, eliminating need for drill jigs, straps, and fixtures.

Collet in foot of tool is inserted into a previously drilled hole, tool is aligned to work; trigger pressure expands and draws collet, clamping tool rigidly to work; drill is then power-fed. Holes of ¼-in.-dia, with a 0.500-in.-dia countersink, are drilled in 5 sec through ¾-in. 75 ST aluminum alloy. Adjustments are provided for rate of drill feed and for drill countersink depth. Close reamer holes can reportedly be drilled on a production basis without subsequent reaming operation.

Winslow Product Engineering Corp, 47 St Joseph St, Arcadia, Calif



Compound Drive Maintains Constant Belt Alignment

Compound drive that provides constant belt alignment through its entire speed range up to 8:1 ratio has been added to Lovejoy's line of variable speed pulleys.

Speed range of 5550 to 690 is obtainable at ¾ hp with a 1750-rpm motor. With an 1150-rpm motor, range is 3650 to 454 at rated ½-hp. Pulleys accommodate the new NEMA motor frame shaft sizes and use a ⅞-in. top width or A belt as standard.

Mounted on one side, spring-loaded design measures 6½-in. OD by 5 in. long; manually operated design measures 6 in. OD by 3⅝ in. long. Mounted alternately, dimensions are 6 in. OD by 3⅞ in. long and 6 in. OD by 3⅝ in. long respectively.

Lovejoy Flexible Coupling Co, 4878 W Lake St, Chicago 44, Ill

Sintered Filter Handles Fluids to 1000 F

Purolator filter made of sintered metal is one-piece unit which can be supplied in a variety of diameters, lengths, and flow rates. Filter is capable of handling fluids ranging up to 1000F and differential pressures of up to 500 lb psi.

According to manufacturer, filter can remove particles as small as one micron from a wide range of fluids, including strong acids and alkalies. Unit reportedly has a higher degree of porosity per square inch than is available in any other high-temperature, metallic-filter element.

Either internal or external threaded connections can be provided by the manufacturer. Threads are used as seals to overcome necessity of using packings, which may cause difficulties at temperatures in excess of 400F.

Dept S, Purolator Products Inc, Rahway, NJ

Thread Repair Kits

Twenty-nine Shop-Pack kits are available, each containing a quantity of stainless steel wire thread inserts, tap and inserting tool in a metal-edged box.

Sizes range from 6 - 32 to 1½ - 6 in both the NF and NC series. Inserts for repair of LH threads in two sizes, 7/16 - 20 and ½ - 20, are available in kits, as well as for 14 - 1.25 mm spark plug threads.

Heli-Coil Corp, Danbury, Conn

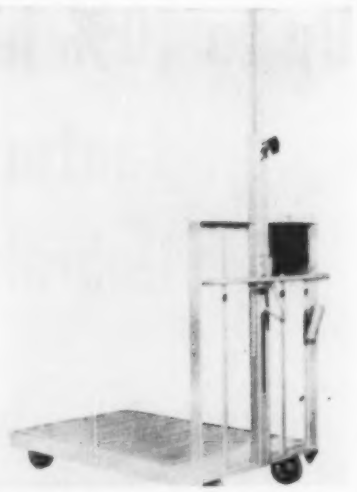
Turco Chemical Compounds

Turcoating is designation for line of phosphating materials which provide a bond on metals for painting or other organic finishing.

Alkaline rust remover offers chemical rust removal without the use of acids or electrolytic equipment. Material is in form of nonflammable powder.

Chem-Mill process is for precision forming of parts by chemicals without the use of physical force.

Turco Products, Inc, Box 2649 Terminal Annex, Los Angeles 54, Calif



Overhead Dragline Cart Has Telescopic Tubular Mast

Mast has two handles for engaging and disengaging from the line. Lower handle locks extension in raised position.

Minimum deck size is 48 in. long by 32 in. wide; deck height is 7½ in. End rack is 42 in. high above the deck. Standard mast is 70 in. high in collapsed position, 85½ in. when raised.

Lewis-Shepard Products, Dept R-35, Watertown, Mass

Portable Tool Makes Electrical Connections

Keller "Wire-Wrap" tool makes solderless wrapped electrical connections with 14 and 16-gage wire. Powered by air motor, tool makes connections in less than 1 second.

2-lb tool has automatic device which stops the bit in the correct starting position. Construction features include alloy steel planetary gears with 20° pressure angle, positive engagement clutch, and ball bearings on motor spindle and idler gear plate.

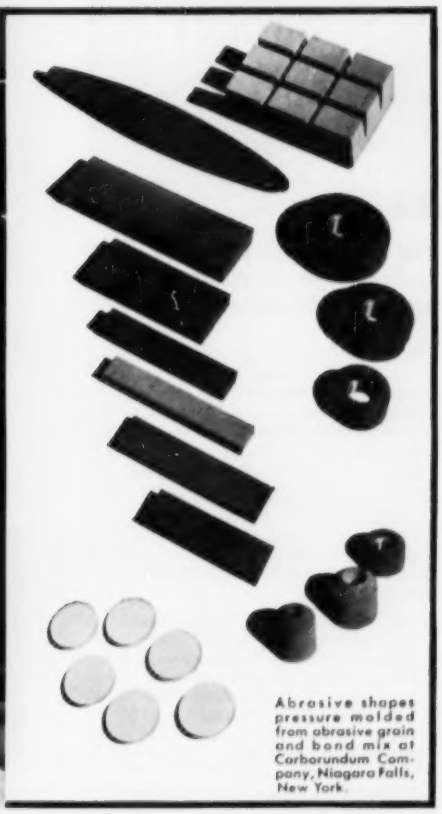
Terminals may be made from commonly used metals; max terminal dimensions are 0.132 x 0.132 in., with minimum 0.375-in. spacing between terminals. Each connection is 11/32 in. long.

Keller Tool Div, Gardner-Denver Co, Grand Haven, Mich

Molding abrasives 50% faster with

DENISON *MULTIPRESS*®

with no downtime



Abrasive shapes pressure molded from abrasive grain and bond mix at Carborundum Company, Niagara Falls, New York.

PRODUCTION here has been increased 50% in molding of abrasive shapes. On operations requiring both molding and cutting, production is increased over 100%.

The operation is semi-automatic . . . the operator has only to remove the molded shapes.

The abrasive grain mix is hopper fed to a shuttle box. The shuttle box automatically indexes into position beneath the Multipress hydraulic ram. Ram pressure, set with hydraulic controls, is precisely duplicated on each stroke. Uniform density of abrasive grains is thus assured on every molded shape . . . with minimum operator training.

Molding dies are reset in a few minutes for different jobs.

What's your production problem? Compacting, riveting, staking, swaging, drawing . . . any operation calling for controlled ram pressure can be greatly improved with the Denison hydraulic Multipress. Have the Denison representative show facts and figures how you can benefit . . . now. Write

THE DENISON ENGINEERING COMPANY
1164 Dublin Road • Columbus 16, Ohio
A Subsidiary of American Brake Shoe Co.

HYDRAULIC PRESSES • PUMPS
MOTORS • CONTROLS

DENISON Hydr-Oil-ics

tough sprayed metal

well-known maintenance method now profitable production process

equipment fabricators find tough, high-quality sprayed metals build big bonus pay-offs

Modern metallizing—metal spraying—which for many years has saved millions of maintenance dollars by restoring worn machine parts for thousands of companies, is now helping many others improve their products, cut production costs.

In the production of new equipment, tough sprayed metal coatings provide highly desirable mechanical or electrical characteristics at low cost, in high speed, semi-automatic production.

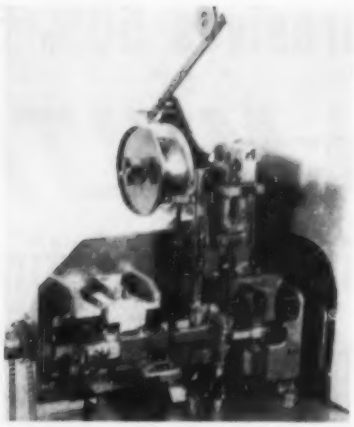
General Electric, for example, a long-time user of metallizing to provide superior wearing qualities on critical areas of large turbine shafting, now applies sprayed metals to a wide range of its products. Many forward-looking companies have instituted investigative programs in their research and design labs to explore the use of metallizing as a means of giving their products competitive advantages in quality, or performance or price—or all three.

Metallizing may be able to help your company improve its products, economically, reduce machine maintenance costs, cut your bills for corrosion protection. It may pay you well to look into it. In any event you will find it a fascinating subject. Bulletin 51 illustrates and describes "Metallizing—its practical applications"—shows actual work being done in users' shops. We shall be happy to send you a copy.

METCO

Metallizing Engineering Co., Inc.

1169 Prospect Ave., Westbury, L. I., New York
Telephone: EDGEWOOD 4-1300 • Cable: METCO
In Great Britain: METALLIZING EQUIPMENT COMPANY, LTD. – Chobham near Woking, England

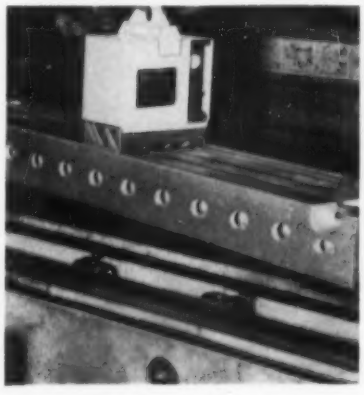


Automatic Embossing Machine Attaches Wires to Metal Tags

Databosser attaches tying wires simultaneously with embossing fixed and variable data on metal identification tags at rate of 75 per minute.

Tag wiring unit, incorporated as an auxiliary automatic operation in the machine, performs 15 different mechanical motions within 8/10 of a second to thread wire through tag, cut off a uniform length, and make a securing twist.

Dashew Business Machines, Inc, 5886 Smiley Dr, Culver City, Calif



Battery-Operated Lifting Magnet

Model SL-4 Ohio Shop Lifter, with 4000-lb capacity, is powered by self-contained 12-v automotive batteries.

Magnetizing surface is 7 3/16 x 20 in., providing deep magnetic penetration for odd-shaped parts difficult to lift with sling, hook, or grapple.

Ohio Electric Mfg Co, 5400 Dunham Rd, Maple Heights, Cleveland, Ohio

Welded Aluminum Chain Available in Four Sizes

McKay welded aluminum chain, said to weigh 65% less than welded steel chain, is available in sizes of ¼, 5/16, ⅜, and ½ in. Chain is made much the same way as other welded chain.

According to manufacturer, chain has unusual non-sparking and non-magnetic characteristics, requires little or no maintenance, and has excellent resistance to corrosion.

Chain is available in color-anodized finishes.

McKay Co, 316 McKay Bldg, Pittsburgh 22, Pa

Toolholder and adapter known as Geni Holder permits changing tool without stopping spindle. Unit consists of combination body and shank, locking ring, two steel balls, and retaining ring. Light push of thumb raises locking ring and releases adapter; when new adapter is inserted, locking ring is dropped, locking balls in adapter slots and providing positive drive.

Universal Engineering Co, Frankenmuth, Mich

Throwaway tool inserts for use in mechanical toolholders are available in Carmet 600 Series steel-cutting grades as well as grades recommended for machining cast iron and nonferrous metals. Blanks are provided in 12 different sizes of rounds, squares, and triangles.

Carmet Div, Allegheny Ludlum Steel, Wanda & Jarvis Aves, Detroit 20, Mich

Electric, 2-hand clutch control for industrial machines has fail-safe, "can't cheat", and "set up and run" features, and is said to increase productivity by eliminating operator worry over personal safety.

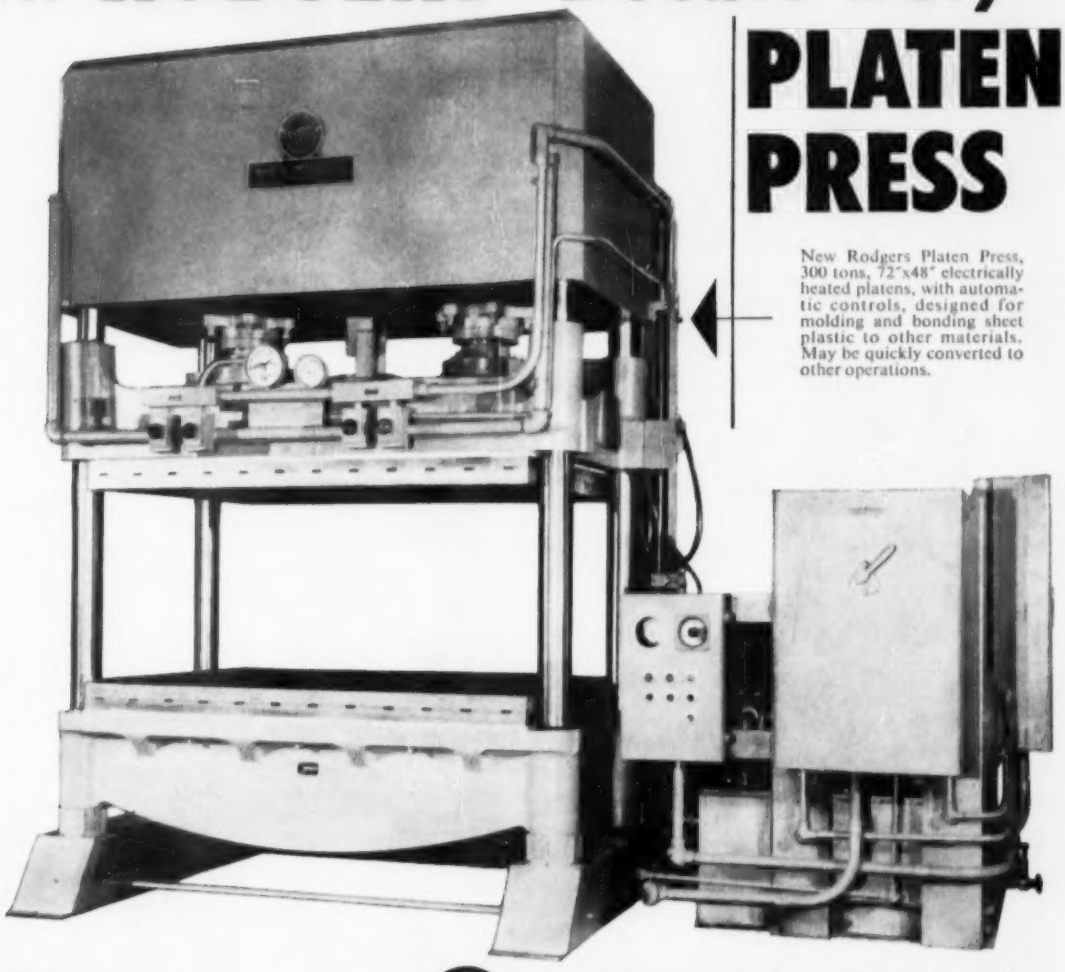
MicroSwitch Div, Minneapolis-Honeywell Regulator Co, Freeport, Ill

Cutoff Machine Cuts up to 2000 Tubes Per Hour

Continental rotary cutoff machine is bench model which will handle tubing between ⅜ and 1¼-in. diameter. Machine is reported capable of producing up to 2000 cuts per hour, depending on diameter, wall thickness, and length.

Tempered alloy steel, guard-pro-

New RODGERS "Double Duty" PLATEN PRESS



New Rodgers Platen Press, 300 tons, 72"x48" electrically heated platens, with automatic controls, designed for molding and bonding sheet plastic to other materials. May be quickly converted to other operations.

1 forms or draws metals

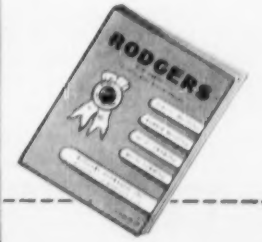
2 molds and bonds plastics in ONE operating cycle

Are you processing both metals and plastics? This newest Rodgers Platen Press is quickly converted for metal or plastic operations—a "double feature" advantage that means equipment savings for you.

Heated platens, which mold sheet plastic *and* simultaneously bond it to metal, rubber or other materials, are interchangeable with metal forming or drawing dies. By using pneumatic die cushions, the press can be converted for deep drawing of metals.

Rodgers "Double Duty" Presses are available in 10 to 500-ton capacities and with platen sizes from 12"x12" to 72"x48". Precision control equipment automatically governs platen movement, pressure, time cycles and temperature. Operator safety is assured by equipment design.

MANUFACTURERS. If you're processing metals and plastics you'll be interested in this double duty press; let us send you more information and also a copy of our catalog describing other Rodgers "Blue Ribbon" Presses for plastic and rubber molding, metal drawing and metal forming.



HYDRAULICS Rodgers KEEP THE WORLD MOVING

Rodgers Hydraulic Inc.

7407 Walker Street • Minneapolis 16, Minnesota

MAINTAIN the EFFICIENCY
of your
AUTOMATIC LATHES
and TURNING MACHINES
with the
OLIVER
20" TEMPLATE (controlled)
TOOL BIT GRINDER

The instant you equip your toolroom with an efficient Oliver, grinding time will be sharply reduced . . . production immediately expedited.

The Oliver method of single point tool sharpening utilizes a controlled and numbered template . . . grinds the complete tool in a single operation on one machine. The simple-to-operate 20" Template Tool Bit Grinding machine grinds single point tools in a fraction of the time required by other methods . . . reduces grinding time on tough tungsten-carbide work as much as 100% to 500% (using a notched wheel, with water on the wheel and through the wheel, makes this possible). Where quantities of precision-ground duplicates are required, the Oliver Way is the BEST!

Single point cutting tools machine ground on an OLIVER TOOL BIT GRINDER provide lasting accuracy *essential* to the efficient operation of automatic lathes and turning machines. Ground on an Oliver, single point tools have a fine finish . . . meet top standards without requiring the usual second operation of diamond-grinding. An OLIVER 20" TEMPLATE TOOL BIT GRINDER is a small investment for your toolroom that is sure to pay large dividends.

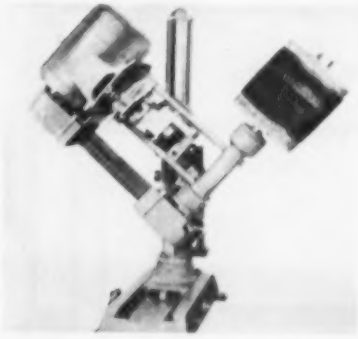
We'll be glad to tell you more—just write, wire or phone.

OLIVER INSTRUMENT CO.
1414 E. MAUMEE . ADRIAN, MICHIGAN

tected, 7-in. cutting wheel is driven by a ¼-hp, 115-v ac geared-head motor. Wheel rotates at 300 rpm, descending to contact tube as handle is lowered. Tube is spun on rollers during operation, so that cutting action is through wall thickness rather than through entire diameter of material.

Complete assembly consists of cutoff machine, mounting stand, and adjustable tube-support table equipped with five dual-roller forks. Larger capacity machines are also available.

Continental Machine Co, 1952 N Maud Ave, Chicago 14, Ill



Wide Face Polishing Wheel

No. 53, which will handle widths up to 24 in., has built-in floating action to give even buffing and polishing on entire surface. Positioning of the work is said to be simplified, and once proper pressure is established, hundreds of pieces can reportedly be uniformly processed.

Two models are available: No. 53 for heavy duty, and No. 54, which is ¼ smaller in size.

Murray-Way Corp, Box 180, Birmingham, Mich

Fork Lift Truck Is Equipped for LP Gas

Automatic Dynamotive, gas-electric fork lift truck, is now available with an engine equipped for operation with LP gas. Engine has been modified to accommodate new system, and a pressure tank added for supplying either propane or butane gas.

Truck is offered in series with capacities ranging from 4000 to 10,000 lb.

Automatic Transportation Co, 149 W 87th St, Chicago 20, Ill

Dieset Guide Post Lubricators

Reciprocating spring oilers, called Die Savers, consist of barrel-shape coil spring 2½ in. long, compressible to a solid height of 3/16 in.

Coils are covered with a tough, highly absorbent tubular wick. End coils fit snugly around guide post and lubricate at each stroke of the press. Two or more can be used for long posts. When both ends are worn, wick is pulled forward and worn part is snipped off.

Wm V Heinz, 935 Hennepin St, La Salle, Ill

Automatically controlled testing machine has typewriter for printing test results. Super L has 60,000-lb capacity. Operator inserts specimen and starts machine. All phases of operation are handled by built-in programmer, and, at end of test, electric typewriter prints result of yield strength, or other test data required. Controller can be set to apply uniform loading speed from 0 to 3.5 ipm until fracture, at which time machine returns to zero load. Device incorporates high speed approach and slow yield speed, both of which are selected on separate dials.

Tinius Olsen Testing Machine Co, 5055 Easton Rd, Willow Grove, Penna

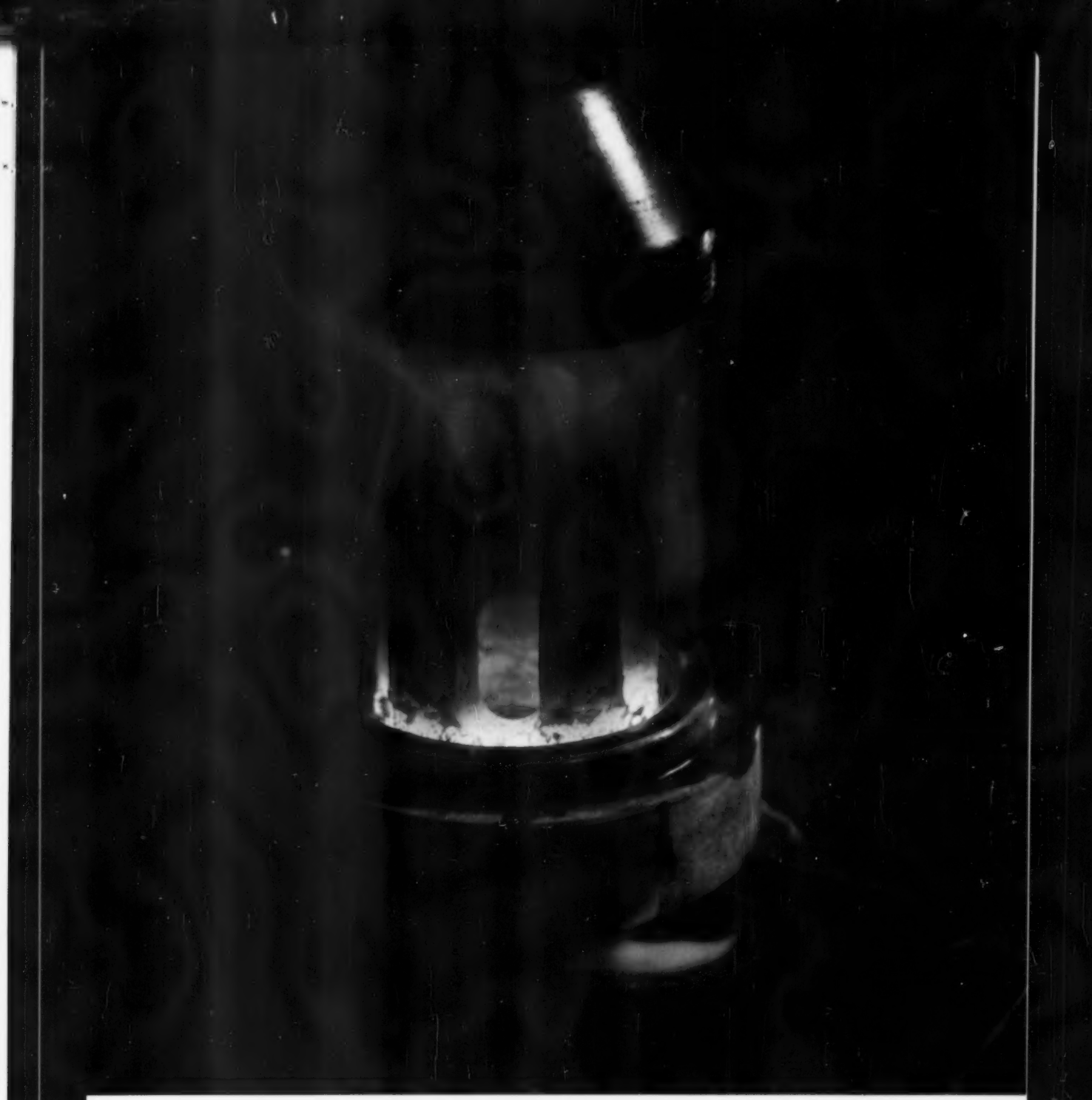
Double-edge hacksaw blade has an 18-tooth side for heavy cutting and a 24-tooth side for cutting lighter materials. Blades are individually carded and edges are identified.

G W Griffin Co, Franklin, NH

Richmont Torque Analyzer For Power Screwdrivers

Unit is said to give fast, accurate, direct torque reading, and indicates trouble area in defective tools without disassembly.

Device utilizes principle of driving a stud in a nut against a sensitive pressure gage. Stud and nut, ball bearing type, reportedly assures high degree of accuracy. Torque output of stall motor power screwdrivers, direct drive clutches, and the Livermont Torque Limiter can be set or



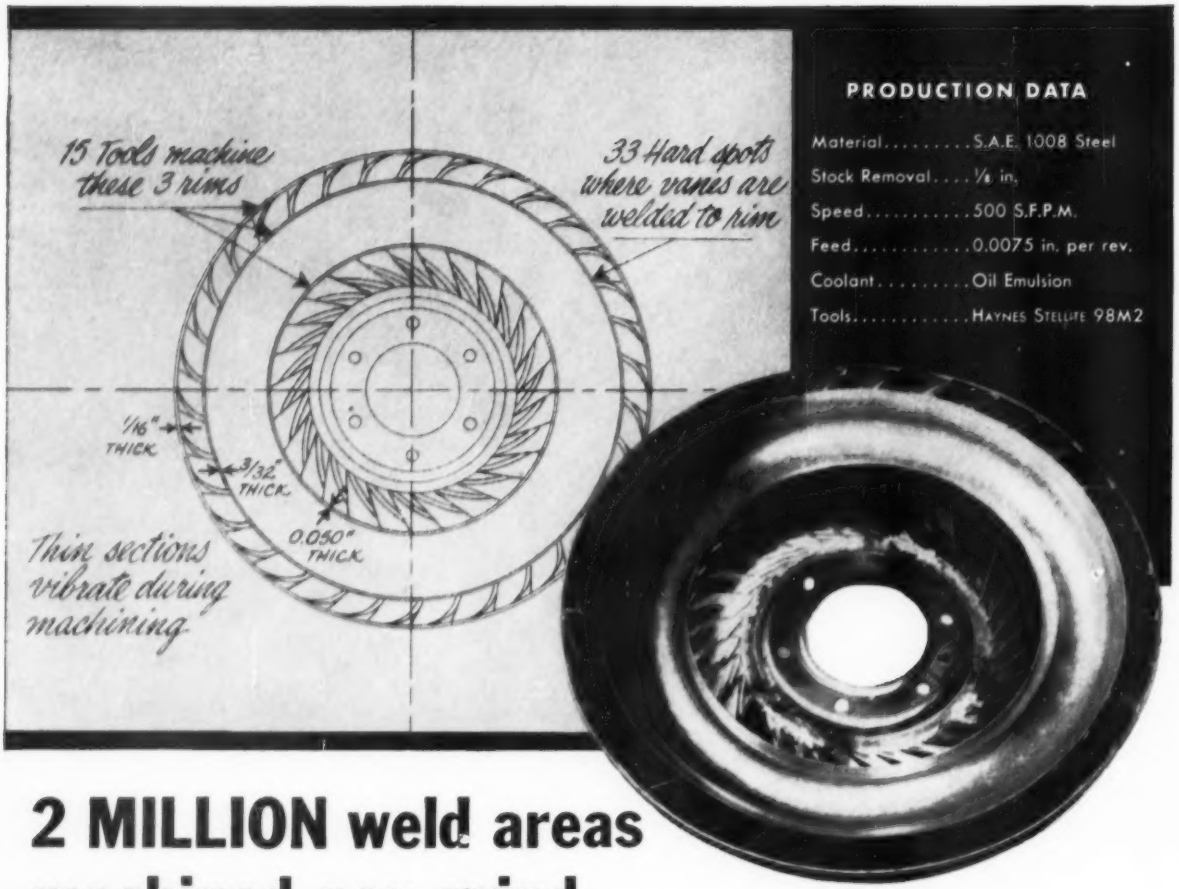
Here's a Hot Number

On "Acorn" Dies truly concentric adjustment demands lands with uniform "give".

Spring tempering by precision induction heating (controlled time and temperature) is one more manufacturing refinement that helps make *genuine* "Acorns" the HOTTEST BUY in spring type dies.

"ACORN" means GREENFIELD — GREENFIELD means QUALITY

GREENFIELD TAP and DIE CORPORATION
Greenfield, Massachusetts



2 MILLION weld areas machined per grind

Haynes Stellite 98M2 tools machine 1,000 of these torque converter turbine wheels between grinds. Fifteen tools are used to machine the three rims. There are 33 weld areas on one of the rims where the vanes are joined to it. On every revolution a Haynes Stellite tool cuts through these hard spots. It makes 2,100 interrupted cuts per wheel . . . over two million per grind. In addition, all 15 tools must withstand the shock set up by vibrations of the thin sections.

The parts are double indexed on an automatic lathe at six stations. Spindle speed is about 160 revolutions per minute. Feed rate is 0.0075 in. per revolution. Machining speed is 500 surface feet per minute. Total machining time per turbine is 28 seconds, and approximately 125 wheels are finished in an hour. The Haynes Stellite tools operate for a full eight-hour shift without chipping or spalling.

Haynes Stellite tools have an unusual combination of red hardness and toughness. They remove metal fast because they can take deep cuts at heavy feeds. For full details write for the booklet, "Haynes Stellite Metal-Cutting Tools."

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

UCC

General Offices and Works, Kokomo, Indiana

Sales Offices

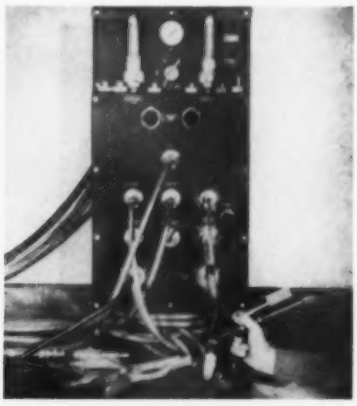
Chicago · Cleveland · Detroit · Houston · Los Angeles · New York · San Francisco · Tulsa

"Haynes," and "Haynes Stellite" are registered trade-marks of Union Carbide and Carbon Corporation.

checked, as well as hand torque screwdrivers and wrenches.

Analyzer operates in RH direction only. Capacity is 0 to 150 in-lb; weight, 40 lb.

Richmont, Inc, 922 S Myrtle Ave. Monrovia, Calif



Portable Control Unit For Inert Gas Welding

Accessory control unit is designed for inert-gas, shielded-arc welds using conventional welding machines. It is said to provide automatic control of torch and back-up gas, torch and fixture cooling water, high-frequency starting spark and welding current.

Current input may be supplied from motor generator, ac or dc; rectifier, dc; transformer, ac; or gas engine driven machines. Additional features: welding current polarity indicator; back-up and torch-gas flowmeter receptacles for conventional arc welding; air pressure regulator with air supply fittings; 110-v auxiliary power receptacles.

Flexweld Mfg Co, Depot St, Buckland, Conn

Pilot-operated, single-solenoid 4-way valves conform to JIC standards. Solenoid is enclosed in dust-tight, watertight enclosure, and is mounted on cover, so that valve is electrically inoperative when cover is taken off. Can be operated manually without removing cover, and locking device is optional. Made in 1/4-, 3/8-, and 1/2-in. sizes.

Automatic Valve Co, 37415 Grand River, Farmington, Mich

GE Induction Heater Line

Line of electronic-type heaters includes 16 models in four output ratings for brazing, soldering, surface hardening, and annealing.

Ratings are: 7½, 15, 25, and 40-kw output. Each model is available with combinations of thyratron power control, built-in transformer, or tapped-tank coil. Additional features include: dustproof cabinets; separate aluminum enclosures for oscillator units; longer tube life, since filament-voltage is regulated with constant-voltage transformer.

General Electric Co, Industrial Heating Dept, Schenectady 5, NY

Crate and carton clamp attachment for lift trucks has hydraulically adjustable distance between bottom forks and top plate of 26 to 76 in., to allow for handling of crates and cartons of 28 to 74 in. height. Stationary forks are covered with abrasive coating, and top plate has adjustable spikes, designed to prevent slipping of the load. Clamp can be shifted 4 in. from center in either direction, to ease positioning the load. Clamp can be rotated 360°. Mounted on 1500-lb-capacity truck, attachment has lifting capacity of 1000 lb, with rotating capacity of 500 lb.

Yale Materials Handling Div, Yale & Towne Manufacturing Co, 11000 Roosevelt Blvd, Philadelphia 15, Penna

Low-hydrogen, hard surfacing electrode, McKay Hardalloy 48, is an iron-powder electrode which deposits high-chromium-iron weld metal, which is said to have surface hardness of more than 55 R_c. Designed to work equally well with DC reverse-polarity or AC welding current. Available in 1/8-, 5/32-, and 3/16-in. sizes, packaged in moisture resistant, vacuum-sealed containers.

The McKay Co, 316 McKay Bldg, Pittsburgh 22, Penna

Lightweight Vertical Sander

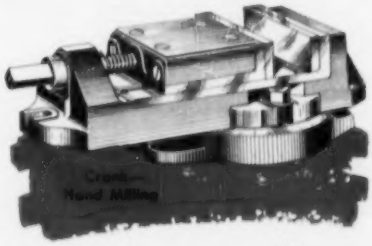
Model 201, a 5-lb unit, is designed for use with soft, resilient back-up pads and abrasive disks. Precision gearing (no governor) provides speeds of 1800 and 3200 rpm in the current model.

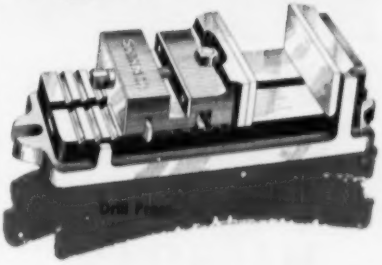
Standard tools are equipped with a 3-step, thumb-operated throttle providing three different positive

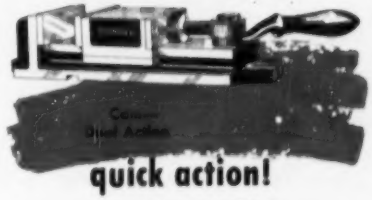
SKINNER

precision machine

VISES







quick action!
positive grip!

Skinner precision milling machine and drill press vises are unequalled in their fast, positive gripping action. They are available in several different models, with either plain or swivel base, to handle all types of milling, drilling, tapping, etc.

Write Skinner or your nearest Skinner distributor for General Catalog.

Booth 508, Production Engineering Show, Sept. 6-16, Navy Pier, Chicago

THE CREST OF QUALITY

THE SKINNER CHUCK COMPANY

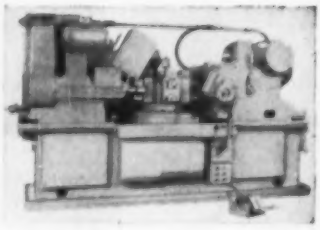
203 Edgewood Avenue, New Britain, Conn.

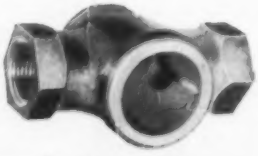
...and parts are finished without rehandling on

GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

The Goss & DeLeeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & DeLeeuw and only Goss & DeLeeuw offers this feature in a standard chucking machine.





A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

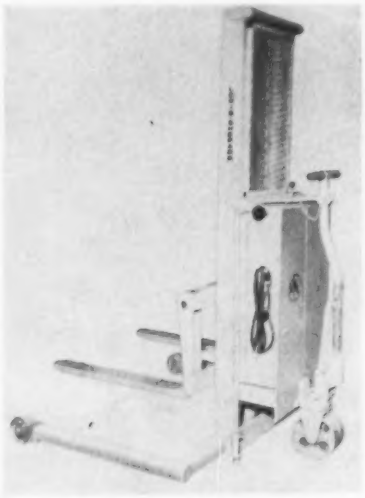
GOSS & DeLEEUW

PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

speed settings. Lever throttle handle for feathering finger control can be supplied as alternate. Air consumption at max horsepower is 31 cfm; stall torque is 5.2 ft-lb. Motor is contained within a cylinder body sleeve.

Master Pneumatic Tool Co, Krick Rd, Bedford, Ohio



Versatile Stacker

Electro-hydraulic stacker with fifth-wheel steer can be used as a lift truck as well as for stacking.

The 1000-lb capacity unit is available either as a platform type for skid platforms or straddle type for pallets. Lifting height is 58 in. at a speed of 25 fpm. It can handle pallets up to 48 x 48 in. Handle locks in upright position when truck is being used as a stacker; it can be pushed, pulled, or steered through narrow aisles. When machine is used as a lift truck, handle is unlocked for normal pulling position. Built-in battery and charger supplies power for raising and lowering loads.

Lewis Shepard Products, Watertown, Mass

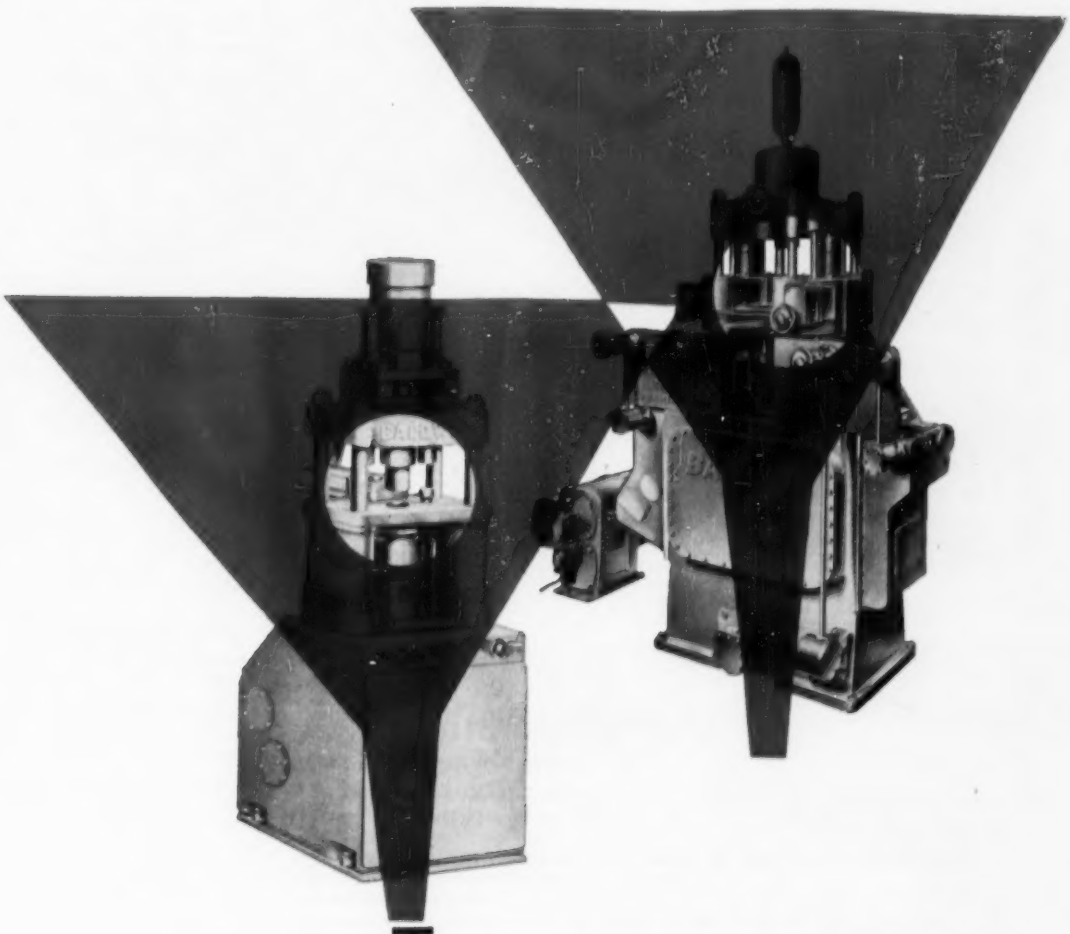
Milling Spindle

Universal's "Kwik-Switch" spindle is designed for use in Bridgeport milling machines. Changeover mechanism is said to cut tool changing to seconds. Spindle eliminates use of a drawbar, reportedly maintains maximum of rigidity in conjunction with minimum of overhang.

Available in sizes for use in ½-hp Bridgeport mills with No. 2 Morse and No. 7 B & S spindles and in 1-hp Bridgeport mills using R-8 collet-type spindles.

Universal Engineering Co, Frankenmuth, Mich

PRECISE FILLING OF DIES *by new Baldwin powdered metal presses makes compacts more uniform . . .*



THEIR highly efficient shuttle type feeders enable Baldwin's new Model "L" and Model "C" powdered metal presses to compact parts much more uniformly. Air operated and cam controlled, this unique feeder moves from under a stationary hopper to a position over the die. It carries the same volume of material over the die cavity each time with a very smooth motion.

This shuttle is supported on guide rods with a spring loaded cutoff ring which prevents loss of material. Cleanline design of the feeder eliminates those recesses or projections that might keep the powder from filling the die cavity completely.

This is just one of the ways you'll benefit by specifying Baldwin Model "L" (50-ton) or Model "C" (100-ton) presses to meet the growing demand for powdered metal parts. These new presses are the very first designed specifically for use in compacting metal powders. Both feature sealed mechanisms, hydraulic heads, special fill adjustments, automatic lubrication and variable cycling.

For our new bulletins on "L" and "C" please write promptly to our Dept. 4702, Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa.

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Philadelphia 42, Pa. • Offices in Principal Cities

"We better get our order off for inventory build up of OILDIE or it won't be a Happy New Year for Pete!"

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

Finishing small metal parts

Chucking operations

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Costly Operations?

. . . then you need a Blount VS-55 Lathe

The Model VS-55 is an economical lathe that handles many of the special jobs that are costly when production machines get tied up. Rugged construction . . . self-contained headstock . . . standard spindle speeds from 600 to 2800 R.P.M., these features mean real performance for any job. Standard bed length is 65", swings 12" diameter over main bed, 16" over gap. Can be furnished with or without bed. Complete accessories available for special operations. For full information please request BulletinA5

SPINDLE: Ball bearing mounted, 9/16" hole through center. TAILSTOCK: Open web, lever clamped to bed, with Morse No. 2 taper center. MOTOR: ½ H.P. ball bearing, 1800 R.P.M. (can also be provided with 1 H.P. drive). FLOOR SPACE: 70" x 18". WEIGHT: 552 lbs.

Manufacturers of Wet Tool Grinders, Woodturning and Metal Spinning Lathes

J. G. Blount CO., 21 WOODLAND STREET, EVERETT, MASS.

ROUND TABLE Discussion

PULL, BROTHERS, PULL

What is the best way to handle the problem of taking on a man in the shop on the supervisor's recommendation that he is a friend of his? Should a foreman refuse if he is dissatisfied with the man's ability?

ONE SHOULD resist favoritism on the part of the boss. However, it is much smarter and much safer to go along with him. A big wheel has neither a moral nor an economic right to order a little wheel, like a foreman, to hire a man simply because that man is a friend of the big wheel. Yet, when a foreman has a family to support and bank loans to pay off he has to be tactful. The boss may be wrong, but he is still the boss.

Members of management, being human, do things which are not right. The company suffers from such actions. Both labor and the public hold a company responsible for that which is done on account of its policies as well as that which is done in spite of its policies.

Every organzation has its "pull, brothers, pull" clique—the boys who are pledged to help one another up, to cover up for one another, to gang up on potential opposition. Where the clique flourishes a business is ruined. A successful enterprise

"About this intricate mechanism your experts are baffled with, it works okay now, I kicked it!"

AUTOMATION ANALYSES
Rank CIRCLE R *Cutting Tools Highest in Efficiency and Economy*

Longer Runs • Less Down Time

Sustained Precision • Fewer Stoppages For Resharpening

For automation as for regular production, Circle **R** saws and other circular metal-cutting tools prove the best you can buy — though they cost no more.

- **CIRCLE R** Specialized Facilities comprise 45,000 square feet — devoted *exclusively* to development and production of circular metal cutting tools.
- **CIRCLE R** Quality and Cost are controlled by Magnaflux Inspection — a scientific method which for us discards rejects before they reach costly finishing stages, and for you eliminates much of the usual down time due to defects.
- **CIRCLE R** Representatives are specialists in metal-cutting problems — backed by Factory Consultation service which reflects continuous research and experience since 1923.
- **CIRCLE R** Standard Products — and specialties tailored to special needs — include the complete range of metal slitting saws, copper slitting saws, cut off saws, screw slotting saws, commutator slotting saws, jewelers' slotting saws, circular knives & rotary shear blades, Circoloy steel saws, solid & tipped tungsten carbide saws, combined drills & counter-sinks, and center reamers.

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MILWAUKEE
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NEW YORK CITY
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CIRCULAR TOOL CO., INC.

PROVIDENCE 5, RHODE ISLAND

Write for Catalog N

Specialists in Circular Cutting Tools Since 1923

ACCO products

Wilson "Tukon" Micro Hardness Testers

A model for every range of pyramid testing
Model LR—Floor model for Micro and Macro Hardness testing
Model FB—Floor model for Micro Hardness testing only
Model MO—Table Model for Micro Hardness testing only

These "Tukon" models meet every fine test requirement

• WILSON "TUKON" Micro Hardness Testers are unexcelled for testing metallic and non-metallic parts such as fine wire, small precision parts, thin metal, shallow superficially hardened surfaces, jewels, plastics, glass, etc.

The three models pictured cover the entire range of diamond pyramid testing—with both Knoop and 136 degree Diamond Pyramid Indentors.

Proper selection of the proper model for your particular requirement depends on the type and thickness of work to be tested, range of loads, purposes for which the machine is to be used—research or control, other hardness testing equipment available and whether a combination of micro and macro hardness testing is required.

We invite you to consult with WILSON engineers on your hardness testing problem. There is no obligation. Write for **Booklet DH-114** *on WILSON "TUKON" Micro Hardness Testers.*

ACCO Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE
230-8 Park Avenue, New York 17, N. Y.

WILSON "ROCKWELL" and "TUKON" Hardness Testers

catches up with such cliques sooner or later.

One finds the clique prevalent in an organization where members of management are selected for their ability to get along with people, for their record of not having made any serious mistakes. The latter is accomplished by calling in a group of one's associates, usually friends, when a decision has to be made. Several people agree on the decision—and share the responsibility.

The clique does not last long in an enterprise where members of management are chosen for their character and loyalty to an enterprise. Managers are custodians of other people's property. They do not need to be brilliant, or smart, or clever. They must be fair, honest and just.

The brilliant, the clever, the skilled man can be trained by others. Character must be developed from within. It's character which gives an enterprise integrity. Since, in the final analysis, business is an instrumentality of the people, only an enterprise with integrity will survive.

The "Brothers" have been more successful in the past than they will be in the future. The quality of management is improving by leaps and bounds. Competition and economic limitations are greater than ever before. Management has more clever and belligerent Monday morning quarterbacks to face. Labor leaders, financiers, and local political powers are sharp critics of managerial decisions.

Oftentimes what appears to be a clique in the shop is a well organized team of result-getters. One must be careful about crying

"This is the eighth day I've traded you turkey sandwiches . . . I'm getting sick of them, too!"

Again...

MERCURY INTRODUCES A NEW

Combined Production Method

GRIND FLASH AND FINS

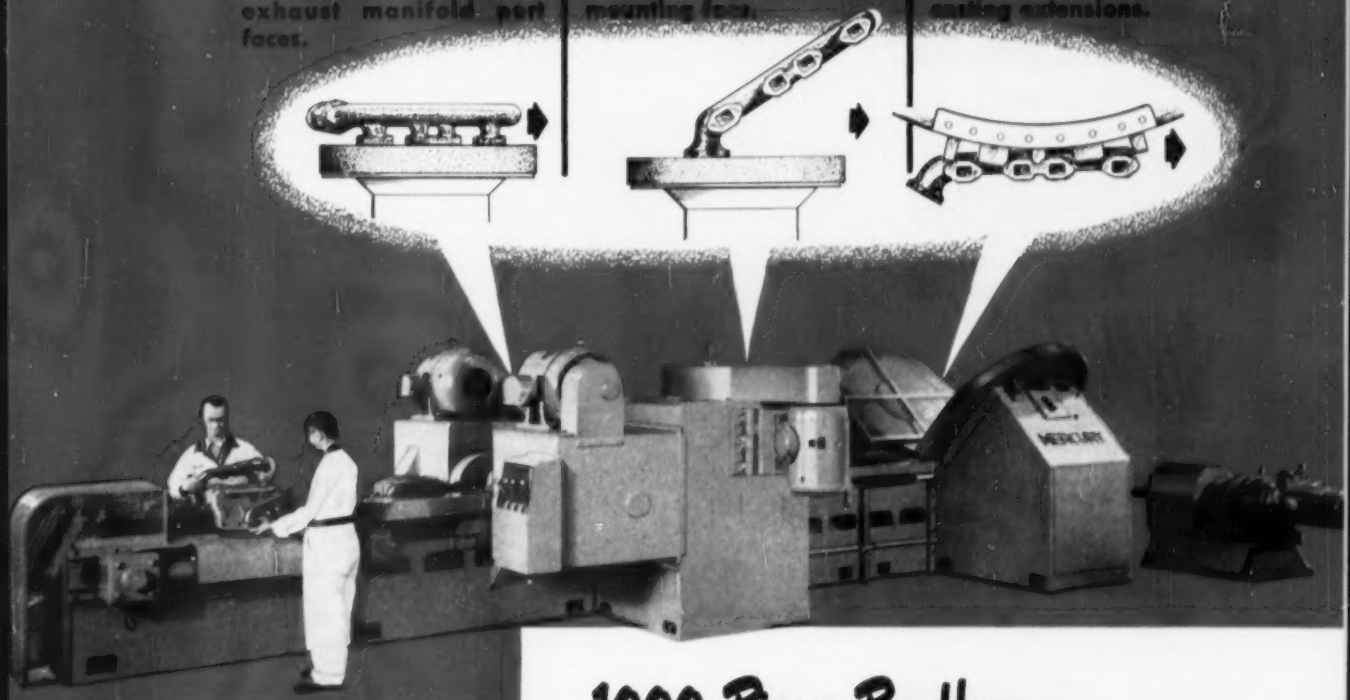
Opposed grinding heads, straddling a conveyor, remove flash and fins from exhaust manifold port faces.

GRIND MOUNTING FACE

Two vertically mounted grinding heads remove flash from exhaust pipe mounting face.

PUNCH FLASH AND FINS

Two rotary punches, timed with the conveyor, punch out flash and fins between casting extensions.



1000 Pieces Per Hour

This high-speed Mercury conveyorized combination grinding and punching line accepts four different types of manifolds without fixture change-over. Each casting is automatically positioned for the three operations described. An automatic unloading device places the manifolds upon a conveyor at a sustained rate of 1000 pieces per hour.

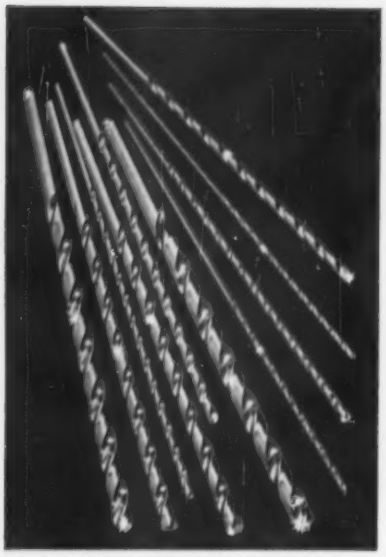
A SYMBOL OF FINE CRAFTSMANSHIP SINCE 1933

MERCURY — *Designers and Builders of Special Grinding Machines*

MERCURY ENGINEERING CORPORATION

Milwaukee 2, Wisconsin

Your Inquiry Is Invited



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ACE DRILL CORPORATION
Adrian, Michigan

Gentlemen: Please send me your Catalog No. 52-A containing complete information on ACE "Ground-from-the-Solid" Drills and hardened H.S.S. drill blanks.

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ACE DRILL
ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

"favoritism." Never underestimate the character of your boss.

In handling the "Pull, Brothers, Pull" incident Al seems to be using excellent judgment. We'll go along with Al.

Peter A Seward
Swampscott, Mass

A FOREMAN is one who leads the activities of men engaged in processing a high-quality product at low cost for delivery on schedule for the purpose of making a profit. When his functions are impaired by being forced to accept an inferior worker who happens to be a favorite of the supervisor, he should bring the matter to a head with the boss as soon as he finds that the new man will not qualify.

Griping about the raw deal that the boss's favoritism fostered will not help the situation. My advice to the foreman is: "Don't find fault—find a remedy. Anybody can complain." I fail to see where it is smarter and safer for the foreman to go along with his supervisor, even if it costs him production. The boss and the foreman should both be interested in the same end-result: to manufacture a good product at a profit. Any action by either that hinders the attainment of this goal is open to criticism and rectification.

A supervisor should definitely not have the right to ask a foreman to take on a friend of his. Next to unnecessary bossing, perhaps the most demoralizing habit of an inept boss is having a "fair-haired boy" around the shop. It is a very natural, human habit to show particular interest in an old buddy or a brother who belongs to the same lodge, but I have seen it cause trouble in the shop where this pernicious practice was permitted to flourish. Even when the amiable lodge brother is an efficient worker, any rewards he may attain may be open to criticism because of the mistaken but natural suspicion that a favorite gets all the gravy. Favoritism on the part of the boss should be resisted because the people not on the inner circle of favor feel insecure and discouraged. They are apt to say resentfully of the boss's pet: "He knows where the body is buried."

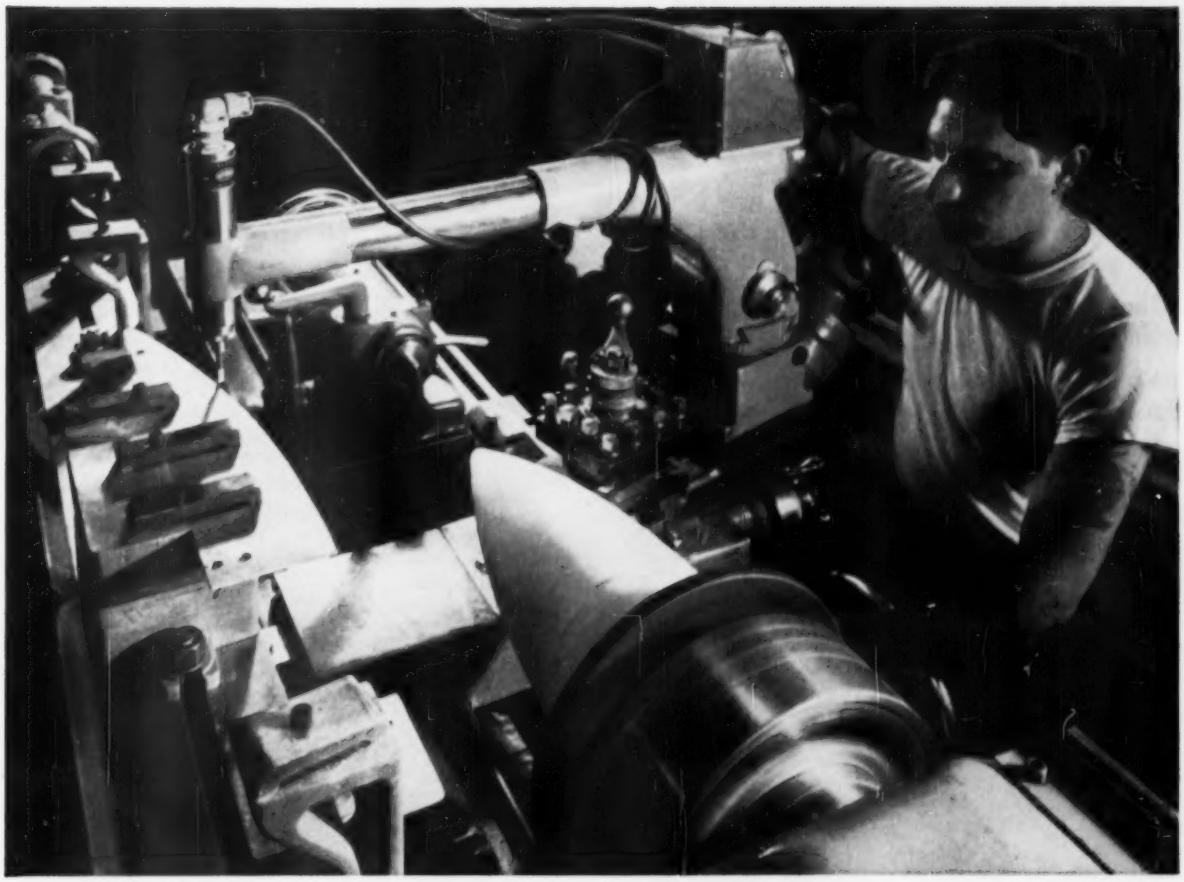
This favoritism business is an unfortunate corollary of the convivial, good-fellow, country-club, or lodge-brother spirit that will no more mix with efficient production than oil with water. This type of favoritism materializes in the objectionable "apple-polisher." Many departments of a plant sprout this kind of individual when the boss permits favoritism to guide his choice of subordinates. The subordinate who chants "check" whenever the boss makes a statement is notorious. Patting him on the back is not only unnecessary but definitely dangerous. Any boss who pulls a favoritism deal or who does not firmly discourage yessing among his sprouting favorites will find himself in bad with the whole staff, and also lose out on valuable suggestions which may differ from the "yes" pattern.

The foreman faced with the problem of the boss's pet who turned out to be a lemon should take the bull by the horns and try to get rid of the man. The boss by his favoritism and aggressive action in foisting an unwanted worker on the foreman, disregarding established channels for hiring workers, has indulged in an overt activity that sets a bad precedent. He certainly lacked tact, reflection, and thoughtfulness in putting his foreman in the awkward and uncomfortable position of either giving his supervisor an argument or going along with him on an obviously unorthodox arrangement.

The hiring process should be divided between the foreman and Personnel Department. If the foreman's supervisor is allowed to inject favoritism in hiring, it might easily be the "camel's nose inside the tent" leading to loss of established, efficient, scientific and unbiased employment precedures by trained personnel.

The forced acceptance of a boss's favorite pet is an unwarranted violation of the foreman's prerogative to have choice in the selection of his workers. When the foreman and applicant for a job have a chance to meet one another in the preemploy-

"What luck! There's the boss of shop six."



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You obtain uniform reproduction from flat templates or models for contouring, profile facing and boring to a tolerance of ±.0015" between template or model and work piece. Another important advantage is that this electronic duplicator as attached to machine tool in no way interferes with conventional operation when used for non-contouring purposes.

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Your lathes, horizontal and vertical boring mills, millers and grinders may be used with Raytheon electronic duplicators. These duplicators are available in single motion—contour to 90°; dual motion—180°; two motion—360°.

For full information write Dept. 6120, Raytheon Manufacturing Company, Waltham 54, Mass., or contact Voss Engineering Company, 7301 Penn Ave., Pittsburgh 8, Pa.

RAYTHEON MANUFACTURING COMPANY

Equipment Marketing Department, Waltham 54, Mass.

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TURN YOUR OWN PINIONS

Mass Gear can generate spur, helical and worm pinion rod in all types of material including plastic.

Mass Gear can also produce any type of serrated or special form rod that can be generated.

These rods are available up to 6 feet in length, from 5/32" to 1 ¼" in diameter.

Mass Gear products are made to A.G.M.A. standards, thus insuring uniform quality.

Illustrated brochure showing interesting designs and suggestions available upon request.

Massachusetts Gear & Tool Co.
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Ruthman Gusher Coolant Pumps Are Adaptable

Illustrated is a Gusher Coolant Pump mounted on Beco Model #410 Automatic Drilling and Tapping Machine.

Photo Courtesy Batchelder Eng. Co., Inc.

Gusher Coolant Pumps readily lend themselves to novel and unusual applications. On the Beco Model #410 automatic drilling and tapping machine, the Gusher Coolant Pump is mounted on roller drawer slides for quick and easy exchange of coolants. On all coolant pump problems you can depend on Gusher Coolant Pumps.

THE RUTHMAN MACHINERY CO.

1818 Reading Road Cincinnati, Ohio

ment interview, after the man has been initially interviewed by Personnel, the foreman being equipped to judge the man's technical knowledge and personality is able to make a good final decision, based on the qualifications and merit of the applicant, as to whether or not he will be able to perform his work, and if he has those factors that will make working together a possibility.

Harry Kaufman
Philadelphia, Pa

CAN A FOREMAN run his department as he deems best to produce quantity production? We might quickly say yes, but have you ever stopped to think that probably only one out of a hundred foremen are given that opportunity. First, company policy prevents the true run of ideas. The foreman is tied here with an invisible thread which is extremely strong. This may be a good idea, for while many foremen are good, capable men they are not always mature, skilled judges of ability, nor can they manage people to the utmost.

We must agree that some control is necessary to properly keep a company from flying apart. Therefore, we see that our answer is no. A foreman, because of his position, is bound to be given orders by higher authority. This, however, leaves a wide gap. We know that many foremen are better qualified to do their job than the supervisor dares give them credit for. A law of self preservation enters into this problem right here. It works both ways. The foreman dares not cross the boss for fear of losing his job. The boss, seeing a chance to keep the foreman

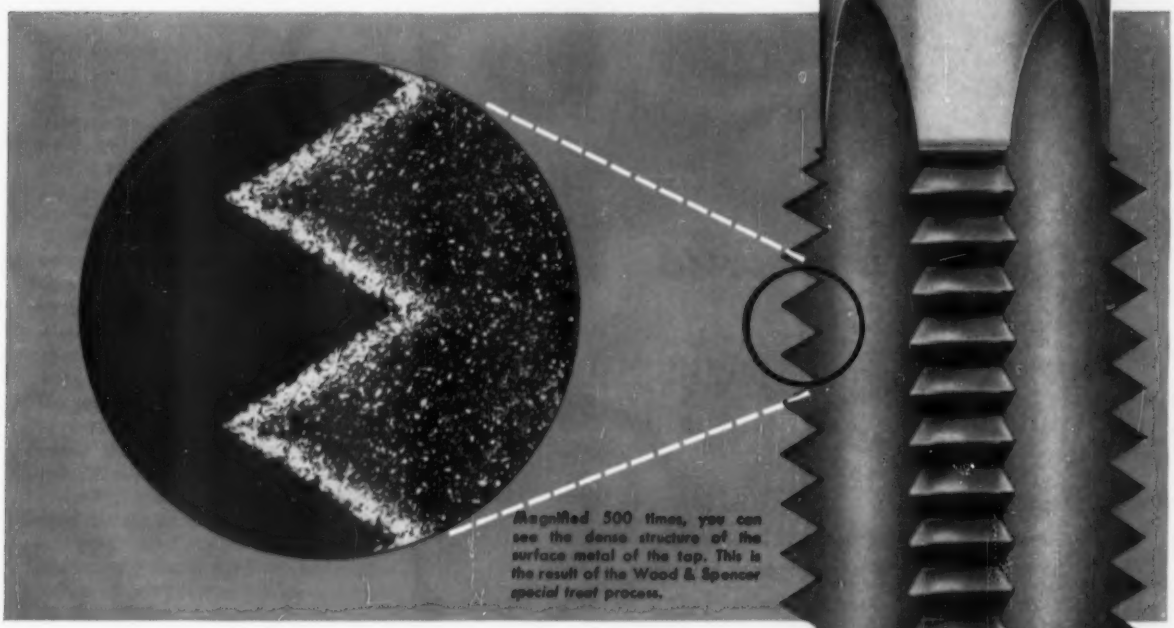
"Just be sure your work clothes get out of the laundry by tomorrow!"

Wood & Spencer

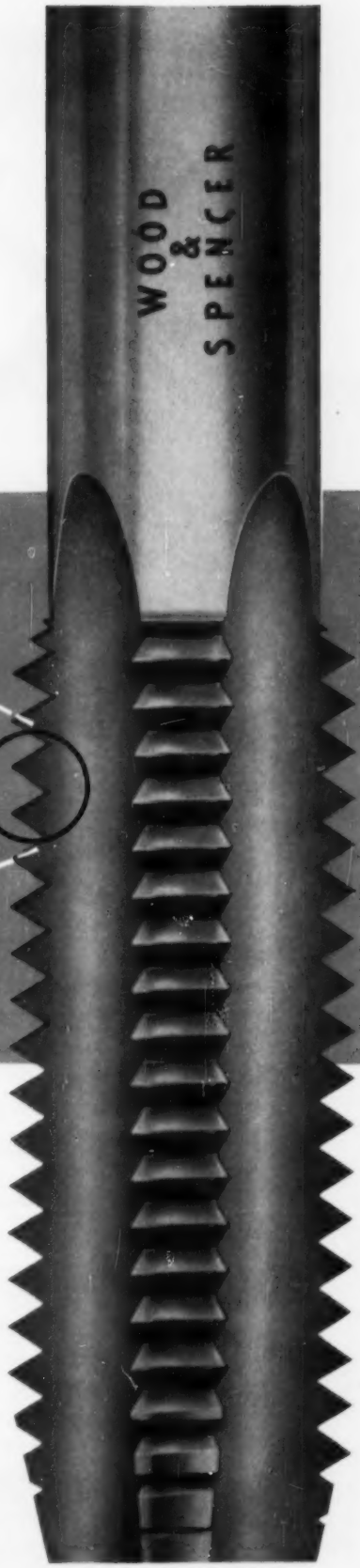
STANDARD **TAPS** SPECIAL

...offer extra Surface Hardness

to preserve cutting accuracy



Magnified 500 times, you can see the dense structure of the surface metal of the tap. This is the result of the Wood & Spencer special treat process.



Beyond the standard heat-treating process is a *special treat* we use on some taps, to give them even more resistance to wear. This additional process imparts an extra surface hardness. The added wear resistance results in a tool which will endure especially demanding production runs . . . and retain threading accuracy throughout.

We recommend these taps mostly for *problem alloys* or for grueling production runs . . . although you may want them for other applications.

We call this additional treating process by the unglamorous name *"special treat."* That's what you ask for when you order. Why not try these extra long-wearing, *special treat* taps? We'll be glad to supply your needs.

Want a free tap guide: Everyone who has one finds this handy wall chart an excellent ready-reference. It tells all standard gage tolerances, class fits and tap tolerances. Write us for one on your business letterhead.

The Wood & Spencer Company • Cleveland 3, Ohio

production begins with

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Get production off to a profitable start! Use Columbus Die-Tool engineered tools. Jigs, Fixtures, and Special Machinery individually designed and built to produce your product alone . . . at a rate to match your production schedule. That's production economy! That's the wisdom of CDT special machinery! That's how Columbus Die-Tool can put your production on a profitable basis. Columbus Die-Tool are specialists in building special tools, jigs, fixtures and machinery . . . have been for over 46 years. Talk over your special problems with us. Absolutely no obligation. Write today.

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ESTABLISHED 1906

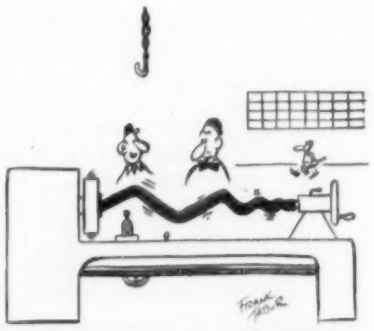
Manufacturers of
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

from being too successful, grabs at the chance to hog-tie his subordinate. So around we go and where we stop nobody knows. One thing is certain, this type of operation does not build for highly successful operations. No company of small or medium size can afford to carry second-raters even if they are the boss's son or a pal of the super's, unless they will blossom into top performers quickly.

In larger organizations much of the disastrous effects are held to departments where the overall picture never reflects the conditions. Sure we hear foremen or supervisors are resigning, even top management, because of differences of opinions in running the business. Sometimes such little things as a pal placed at random in a department is the start of the trouble.

Not too many people believe that it is better to do a job right and maintain high standards than to be dictated to and have to continually compromise the standards, to take the blame for the department which actually is being undermined by the boss's pal. No—most of us are looking for security and a paycheck. You have neither if you stick to your guns and will not be compromised. Why this should be is hard to tell, but perhaps it is a human trait to try to gain advantage by force, to try to maintain your level of attainment by stepping all over people who are just under you.

Too much of our thinking today is "what can I get for myself," not "what can I do for others." We are money-mad and regardless of conditions we do what will keep us safe. Thus, while it is not good sense, we must go along with the boss. We must put his pals to work and we must cover up for them. Quite an order, but what can you do if your attitude is "I must keep my job . . .



"Shall I put the indicator on it?"

perhaps I can get a favor from the boss in return."

In the company that uses this technique it is a one-way street—always down, but never in reverse. Don't count on favors from superiors if they are forcing you to take on help that is only fair. Remember when the day of reckoning comes you will have to account for the department's low production. Your boss will not stand by and say you missed because he put so-and-so in your department. Not on your life. You hold the bag—it's *your* department. You can't win unless you want to take a chance and object to your boss's pal before you get in too deep.

Where are we? Right back where we started. An answer must come from each individual. Have you gumption enough to stand up for your rights? Are you willing to take a chance of being fired? If so, then don't take all the pals of the super.

Charles D Townsend
West Hartford, Mass

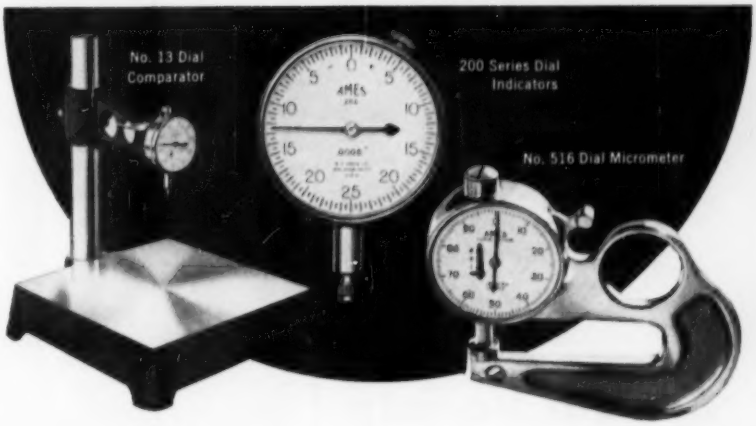
THIS IS ANOTHER slant on the old saying that "business is built on favors," and while we can sympathize with Ed and appreciate his position, it happens to be one of those minor irritations that afflict the lives of every foreman.

Theoretically, Harrison has no business foisting his protege on Ed. Again, in the cold, pure light of business logic, Ed is not compelled to employ Harrison's lodge-brother.

But we all have to realize that life is full of compromise and Edhas been around long enough to know that in all probability Harrison himself doesn't feel too good about the situation. After all, it isn't easy to turn down a friend, and if Ed makes an effort to fit him into the organization, Harrison would be a poor sort

"OK, Smitty . . . cut the comedy"

AMES



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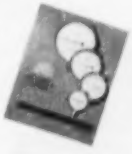

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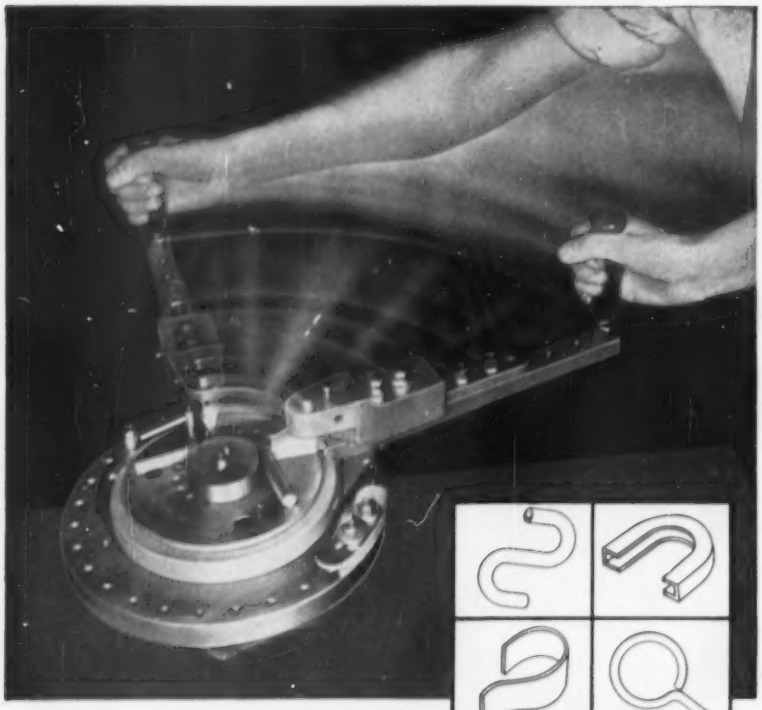

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of individual if he didn't appreciate the fact.

I feel certain most of us, if placed in Ed's situation, would react in somewhat the same manner. I am inclined to think, too, that Al is taking his lofty position in the matter because he has been lucky in not being involved in a like situation. It becomes a different matter when you instead of the other fellow are elected to take in the orphan.

To get down to brass tacks, every foreman would like to have a shop full of 100% producers, men who can be depended upon to tackle any job in the shop successfully and with the minimum of supervision. But experience has taught us that wishful thinking and the cold, hard facts of life are as far apart as the poles, the foreman has to make the best of the material given him, human or otherwise.

Presumably, Al's idea of resisting favoritism would be to have a good old-fashioned showdown with Harrison, in which the logical ending would be that one or the other of them would back down. Assuming that Harrison has a good record as a supervisor, Al's chances of gaining his point would be rather slim and a great deal of friction would be generated that would do more harm to future harmony and cooperation than the hiring of a passably fair machinist.

If Harrison's friend is a willing individual and makes no effort to capitalize on his friendship with the supervisor, Ed should have no trouble in finding a spot for him suitable to his limited talents. If he showed promise of developing into a good man to have around, so much the better.

In any event, the fact that Ed

"Did you have to paint them all straight in line?"

was willing to go along with Harrison would put Ed in a good bargaining position.

There is a good deal to the old saying that "You catch more flies with molasses than with vinegar."

Robert S Alexander
Glastonbury, Conn

THIS PROBLEM of taking on an employee at the request of the boss faces practically every one of us during the course of our lives. Circumstances prompting the superior to request a place in the organization for his friend must be known before the case can be termed as sheer favoritism. A great many individuals sometime or other during life's course need a little lift or helping hand, and many times such a boost can only be got through a sympathetic friend.

If the "inherited" friend is not lazy, and in possession of normal skills, I would say that there would be nothing wrong with going along with the boss. Sometimes such an employee can become a valuable addition to the work force.

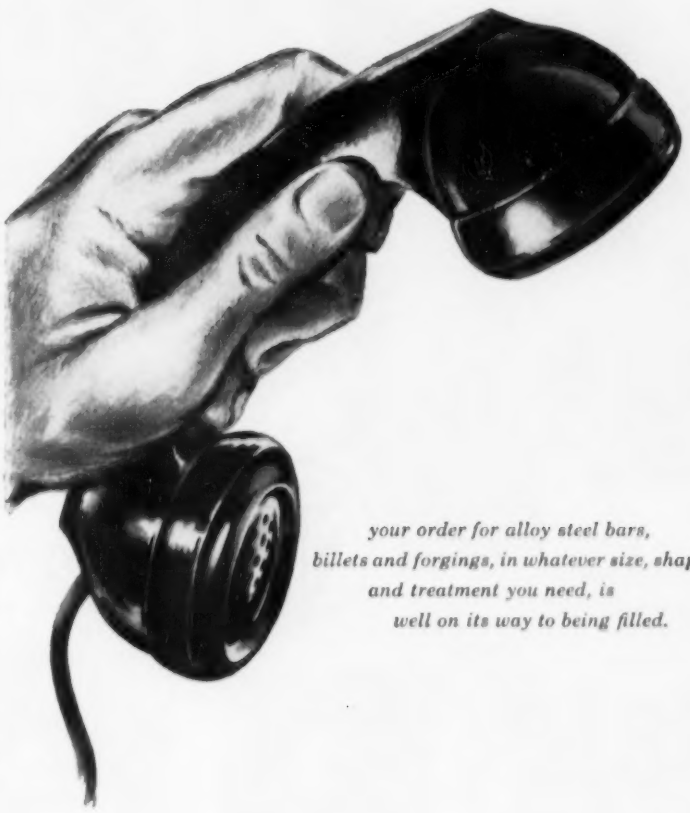
On the other hand, if such an employee is placed on a job where he has neither the skills nor aptitude, with the resultant scrap and low production, then such a condition should not be tolerated. Bosses' wishes or not, an employee of this type can certainly lower the working morale of the department. If a situation of this character is allowed to persist, it can only result in lowered quality and production. If one man can get away with it the others will soon follow.

It would be best for the foreman in a situation of this nature to tactfully approach the boss and clear up the matter, because such a condition sooner or later catches up with everyone. In most cases the boss will go along with the foreman and clear up the problem. There always exists the possibility that there may be another place in the organization where the friend may be placed to an advantage.

It has always been my sincere belief that there is a niche for every man who desires a job or career in industry, providing he is endowed with normal intelligence and demonstrates a willingness to work or train for special skills. If this fact is kept in mind by those responsible for placing people on jobs, there would be no need to worry about the tinge of favoritism.

Peter L Budwitz
New Britain, Conn

Before you hang up,



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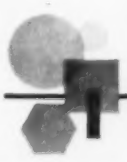

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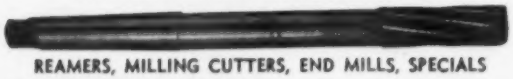

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Talking About Die Sets

WITH

PHIL MARSILIUS

Vice-President
The Producto Machine Co.

Proper Care of Die Sets—How can you be sure your die set will be as accurate the day you tool it as it was when the manufacturer assembled it? While he guarantees the set he has shipped to you, the manufacturer has no control over the treatment it receives after it leaves his plant.

Unusually rough treatment or exposure to moisture—which can occur in transit, on your receiving dock, in your stockroom or in your toolroom—can easily destroy the die set's accuracy. Though these occurrences are rare, you should protect yourself against them by a prescribed routine.

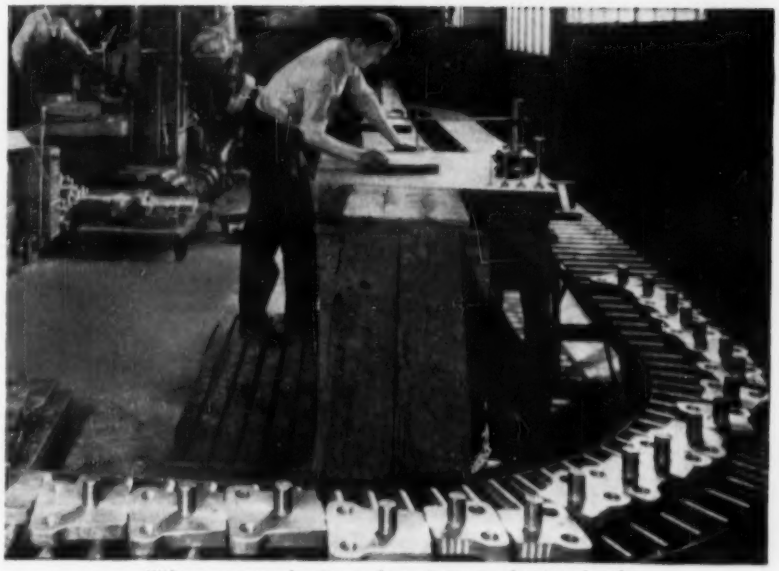
When a die set reaches your receiving dock, inspect it immediately. If rust or misalignment has occurred and is not detected until the set is ready to be tooled, you may have serious production delays.

We recommend the following procedure: 1) Uncrate the die set; 2) Clean the set without disassembling; 3) Check it for parallelism; 4) Check it for free movement of punch holder; 5) Lubricate the pins and bushings; 6) Coat all critical surfaces with a light protective film of oil; 7) Store the set in a dry area on wooden blocks or pallets. You can then be sure that every die set is always ready for use.

If inspection shows something is wrong with the set, contact the manufacturer immediately for permission to return it for repair or have a replacement issued.

When production with the die has been completed, repetition of the above procedure will insure that the tooled die set will be ready for immediate use when needed again.

By these simple steps, you can preserve the degree of accuracy built into the die set.



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Whether you specify two Producto die sets or two hundred, you can be sure they will be *consistently* accurate to the highest standards of the die set industry.

If you're looking for valuable ideas on die sets and their application, write for our free quarterly, *Die Set Digest.* And if you're looking for precision die sets fast, remember to call your nearest Producto branch.

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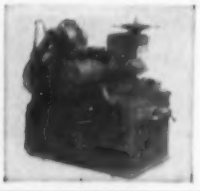

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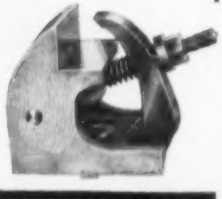

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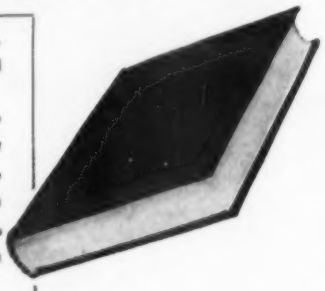

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NEW ADVERTISEMENTS Address N.Y. Office, 330 W. 42 St., N.Y. for January 16th issue closing January 2nd

REPLIES (Box No.) Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

Machine Shop Assistant needed by medium sized heavy process machinery manufacturer. Young college engineer graduate with some experience preferred. Position has a future. First duties will cover rate setting, carbide tool development and assist in increasing productivity. Company has liberal profit sharing plan. Salary open. Location S.E. Penna. Reply P-7616, American Machinist.

General Foreman for machine shop and structural shop employing approximately 120 men. Must have thorough knowledge of up to date tools and manufacture of heavy machine structures. P-8412, American Machinist.

Advertising man, copy-layout, familiar with machine tools. Well known machinery company. Send complete resume. Our staff knows of this ad. P-8529, American Machinist.

EMPLOYMENT SERVICE

Salaried Positions, $5,000 to $35,000. We offer the original personal employment service (established 45 years.) Procedure of highest ethical standard is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 652 Brisbane Bldg., Buffalo 3, N. Y.

SPECIAL SERVICE

Time Study Equipment Time Study Boards with UCEZ transparent watch holders. Stop-watches —Pedometers—Slide rules, counters etc. Time study forms in stock. Write for free sample kit. O. P. Co., 5544 So. Homan, Chicago 29, Ill.

NEW 2nd PRINTING
MACHINE TOOL RECONDITIONING & the Art of Hand Scraping
Write for folder describing illustrated book
MACHINE TOOL PUBLICATIONS
215 Commerce Bldg., Fourth & Wabash Sts.
St. Paul 1, Minn.

10 to 12 ft. lengths
ALL METALS
Also Screw Machine Products to Order
EASTERN
Makers of H & G Die Heads
Machine Screw Corp.
20-40 Barclay St.
New Haven, Conn.

Large Machine and Weldment Capacity
Open capacity on 24 ft. and 10 ft. Vertical Boring Mills 7", 5" and 4" Horizontal Boring Mills; large radials and supporting small machines including new 2 AC Warner & Swasey automatic chucking. Especially interested in producing weldments requiring machining.
C. H. WHEELER MANUFACTURING CO.
Sedgley Ave. at 19th & Lehigh, Philadelphia 32, Pa.
Phone: Henry Kingston—Sagamore 2-6500

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them
GENERAL PATTERN WORKS
2233 Rack Street Cincinnati, Ohio

SELLING OPPORTUNITY OFFERED
Foreign Manufacturer of high quality Turret Lathes, Automatic Lathes, Vertical Milling and Boring Machines, Automatic Keyway Milling Machines, Internal Grinders, Slotters, Table and Way Grinders, Special Machinery, has exclusive territories available throughout the United States for machine tool dealers. These machines are backed up with national advertising, tool show participation and service and parts available in this country. Manufacturers agents with experience and initiative to establish dealerships will also be considered. State experience and qualifications.
RW-8635, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

WANTED EXPERIENCED MACHINE DESIGNERS
Long Range Program. Send complete resume to:
CONTINENTAL TOOLING SERVICE, INC.
19 W. Fourth St., Dayton, Ohio

WANTED
MACHINE TOOL SALES ENGINEER
to represent
World's Fastest Threading Lathe
Send Complete Resume
MAN-AU-CYCLE CORP. OF AMERICA
132 53rd St., Bklyn 32, N. Y.

PEACOCK CORPORATION
Propane Gas Installations
and
Anhydrous Ammonia Plants
Paul E. Peacock, Jr., Pres.
Box 268 Westfield, N. J. Westfield 2-6258

FOR SALE—GORTON P-23 PANTOGRAPH
3 dimensional—Latest model—used only 2 weeks. Guaranteed perfect condition.
Cost with tools, table, etc. $5,600 . . . Ask $4500. Best offer takes it.
W. TOTTEN
1800 El Cerrito, Hollywood 28, Calif.

Indianapolis MACHINERY & SUPPLY CO.
1961 South Meridian Street
Indianapolis 6, Indiana
- SBD 72-30 American Duplex Vertical Broach 30-ton 72" stroke. 1943.
- 36" x 240" Centers Niles Timesaver Engine Lathe. New in 1941.

Write for Complete Stock List
LATE TYPE MACHINE TOOLS

SALES ENGINEER

25 to 35; excellent opportunity for person fully experienced in selling small cutting tools such as milling cutters, end mills, reamers and hobs; must be familiar with all phases of selling and servicing customers, as well as practical experience in use of these tools. We are looking for a man currently employed in this field who is looking forward to advancement to sales manager; salary open. Please send complete resumé and salary requirements. Address

P-8543, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

OFFERED FOR SALE
Machine Tool Manufacturers of Turret Ram Type Vertical Miller Machine
We will sell patterns, jigs, fixtures, prints and all rights to manufacture our line of millers. Our line is well established throughout the United States by a great number of active dealers supplying more orders than we can take care of at present.
We find ourselves in the position to greatly expand our facilities or to sell out this machine line we manufacture.
FS-8297, AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

BENNETT MACHINERY CO.
GUARANTEED MACHINE TOOLS
BORING MILLS, 4½" bar Sellers, Floor Type, Modern
4" & 3½" Bar Landis, Floor Type (2)
3" Bar Universal, Thle. Type, Triway
GRINDERS, 12"x48" & 16"x96" Landis, Late (2)
60" Hanchett Vert. Spin., No. 300 Hyd., Surf.
Nos. 2B Reid, 3B Abrasive, Surf.
36"x42" Pratt & Whitney Die & Surf.
JIG BORER, 2A P&W., '54
RADIALS, 4'9" & 4'13" Amer. Hole Wizards, '53
4'13" Col. Bitk., New 1944
LATHES, 25"x102" Cen. L. & S., T.A., Late
16"-29"x102" Cen. Nebel, T.A., '45
14"-10½"x78" Cen. Monarch, T.A.
TURRET, Nos. 2 & 3 Mercy—2, 3 W. & S.
SHAPER—32" Cinci., '41; 24" Cinci. Univ., '40
SHAPER, VERT., 12" Pratt & Whitney, 1942
SLOTTER, 35" Rockford, Hyd., '44
375 Allwood Rd., Clifton, New Jersey
Phone: PRescott 9-8996 N. Y. Phone: LOngacre 3-1227

BUY FROM STOCK
Telephone
BAKER 5887

FALK
MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented

LATHES

No. 3-A WARNER & SWASEY Universal Turret Lathe 6" capacity M.D. Late Type.

No. 5 BARDONS & OLIVER Univ. Turret Lathe, 2" cap., Preselector, Bar & Chucking.

27"x18' MONARCH "N" Geared Head Lathe, 11' centers, Taper Attach., Full Equipment, Late Type, 1942.

36" BULLARD Vertical Turret Lathe, Turret Hd., Side Hd. M.D.

No. 2, 4, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No. 7 BARDONS & OLIVER Universal Turret Lathe, 2½" capacity. Preselector Head.

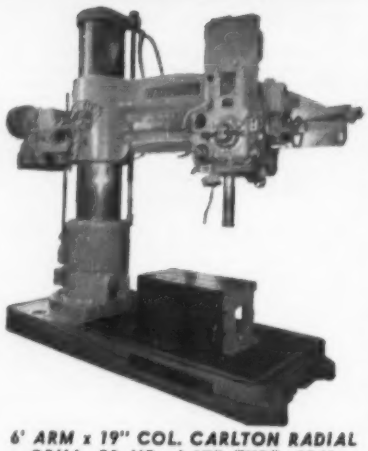
DRILLING MACHINES

No. 262 BARNES Motor Driven Sliding Drill Press, 2" cap. in steel, 1941.

No. 2 M. T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive, Late Type.

1A PRATT & WHITNEY Jig Borer, with Gauges, rods, Collets and Chuck.

4'x15" CARLTON Radial Drill. Motor on arm.



6' ARM x 19" COL. CARLTON RADIAL DRILL, 20 HP., LATE TYPE, 1943

No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D., Late.

No. 18 MARVEL Hydraulic Roll Stroke Power Hack Saw, 18" x 18" cap., M.D.

No. 92½-E TOLEDO Straight Side, Double Crank Power Press, 32" x 60" bed; 6" stroke. 100 Ton Capacity.

No. 2, No. 4 CINCINNATI dial type Horizontal Mills, Motor Driven, Late Type.

400 tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 12' to End Support, M.D.

No. 1, 2 BUFFALO FORGE Vertical Angle Bending Rolls, M.D.

No. 5 NIAGARA O.B.I. Press, M.D.

No. 6 FEDERAL O.B.I. Press, 65 tons, cap., single geared, 4" stroke, M.D.

⅓, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

36" ROCKFORD Hydraulic Openside Shaper, with Side Head, Late Type.

No. 8LS FELLOWS M.D. Gear Lapping Machine. Detachable Head, Univ. Work Support.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine, M.D. Late type.

10' x ¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

30 KW LEPEL Induction Heater, Late Type.

GRINDERS

No 14 WD HAMMOND Double End Carbide Grinder, M.D.

6" x 10" x 48" NORTON Hyd. Horiz. Surf. Grinder, M.D.

4T SELLERS TOOL GRINDER, M.D., Late Type.

30" INGERSOLL Face Mill Cutter Grinder, M.D.

6" x 18" LANDIS Type "C" M.D. Hyd. Cylindrical Grinder, Serial #29196.

#TG848 JONES & LAMSON Thread Grinder, Lathe, M.D.

No. 208 BESLEY Motor Driven Disc Grinder, 26" wheels, Late Type.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke, Motor Driven.

15'x10'x36' BETTS double housing Planer, 4 swivel heads tendant control box table Motor Driven.

OVER 1000 MACHINE TOOLS AVAILABLE IN STOCK . . . SEND US YOUR INQUIRIES

HB MACHINE TOOLS

Serving the World's Largest Manufacturers

#45—5" Giddings & Lewis Horizontal Table Type Boring Mill Serial #18151

42" Vertical Bullard Serial #5708

(2) 13" Peerless Power Hack Saws

#72A3 Heald Sizematic Internal Grinder Serial #12276

Sidney Cone Head Lathe Serial #3308, swing 36" bed 32'.

MONA MEMBER

NEW - USED REBUILT MACHINERY

HAZARD BROWNELL MACHINE TOOLS INC.

350 WATERMAN STREET PROVIDENCE 6, R. I. DEXTER 1-6880

McDONALD
USED MACHINERY

Niagara 12' Power Square Shear, No. 14-Ga. Cap.
Brown & Sharpe No. 2 Surf. Grinder All Motorized Late.
Colburn 2-Spindle Box Col. Heavy Drill M.D.
Niles (Timesaver Model) 32"x14' Bed Grd. Hd. M.D.
Lambert 4" Bar Table Type Horiz. Boring Mill
Ohio 24" M.D. All Grd. Feeds Shaper 1942 model
Cincinnati No. 5 Rect. Overarm Grd. Hd. Plain Horiz. Miller.
Baush 44" Vert. Boring Mill 2 heads.
Knight #40 Vert. Jig Borer.
American 20"x8' Grd. Hd. Lathe motor in base.
Landis 20"x72" and 18"x96" Plain Ext. Grinder.
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table
W & S No. 2-A Grd. Hd. Univ. Turret Lathe chucking
Rivett No. 104 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.G.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box Tables
Heald No. 72A-3 Hydr. Int. Grinder Rad Head Sp.
LeBlond G.C.G. Ext. Bed Gap Lathe 19".40" swing by 11'9"/12' centers.
Cincinnati No. 2 HI-Power S.P.D. Vert. Miller.
G & L 3" Bar Horiz. Boring Mill.
Barnes 20" All Grd. Camel Back Drill 1-Sp.
Blanchard M.D. Vert. Sp. Surf. Grinder 20" chuck.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Ret. Surf. Grinder 12" chuck 1942.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Hendey 16"x8' bed Q.C.G. Lathe 1939.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kompsmith No. 2 Vertical Maximiller M.D.
P & J #2 Auto. Prod. Miller, 2 Tables.
Cincinnati #2, #3 & #4 Centerless Grinders, all Motor Driven.
Bullard 24" Vert. Turret Lathe.
Lynd-Farquhar 26" stroke openside Shaper Planer.

MONA

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

ELECTRIC FURNACES TO 1850F

with Auto Temp Control. Sliding door, heavily insulated, substantial, accurate, dependable for machine shop, tool room, laboratory New
8"x12"x15" inside 4.5 K.W. $300.00
12"x16"x20" inside 9.0 K.W. $500.00

ELECTRIC TEMPERING POT 350-1000F

with Auto Temp Control; 3 gal. cap. uses No. 1 salts permits such tempering after quenching. Complete with Basket and 40 lbs. No. 1 salts $100.00

E. H. WILLIAMS
BOX 9042A, HUNTINGTON, W. VA.

MOST DIVERSIFIED STOCK IN THE U. S.

POWER PRESSES all types, 1-1000 ton
POWER PRESS BRAKES & POWER SHEARS
WIRE WORKING MACHINERY, Wire Drawing, Straightening and Cutting 4-Slide Wire Forming Machines
ROLLING MILLS, SLITTING MACHINES
BOLT & NUT MACHINERY
ROLL FORMING MACHINES
MACHINE TOOLS
"If it's machinery; we have it."

NATIONAL MACHINERY EXCHANGE
138 Mott St., N. Y. CAnal 6-2470

WORLD'S LARGEST STOCK
PRESSES
JOSEPH HYMAN & SONS
TIOGA, LIVINGSTON & ALMOND STS.
PHILADELPHIA 34, PA. · GARFIELD 3-8700

No. 00G B & S Automatic, H.S.
Fosdick 4-spin. No. 5BMA Drill.
No. 35 Van Norman Plain Mills.
Jarecki BB Screw Press, 80 tons, 1948.

D. E. DONY MACHINERY CO.
4357 St. Paul Blvd., Rochester 17, N. Y.

Here are a few of the more than 2000 Machines Currently in Stock . . .

MULTIPLE SPINDLE DRILLS

3 spindle 24" Barnes Alt Geared Self-Oiling, m.d.
#115U Moline Multiple Spindle Drill Press
No. 3 Baush, m.d., 16x30" head
No. 3 Baush, 20x40" head, m.d.
3 spindle 28" Cincinnati Bickford Upright Drill, m.d., No. 4 M.T.
4 spindle Niles-Bement-Pond, m.d., 12' rail, No. 5 Taper
No. 924 Barnes Vertical Drilling, Boring, Facing & Reaming Machine
6 spindle W.F. & John Barnes Vertical Drilling Machine, m.d.
No. 16 Foote-Burt Fixed Center, m.d.
3 spindle Rockford 12" Gang Drill, m.d.
26" 2 spindle Floor Drill, m.d.

UPRIGHT DRILLS

D4 Colburn, m.d.
D8 Colburn, Heavy Duty, m.d.
20" Cincinnati Bickford Super-Service Prod. Drill, m.d.
24" Aurora, m.d.
24" Cincinnati-Bickford, m.d.
32" Aurora, belt drive
36" Cincinnati Bickford, belt drive
No. 2 Colburn Mfg. Type, m.d.
No. 315 Baker Heavy Duty, s.p.d.
No. 4—48" Defiance Machine Co. Drill, m.d.
No. 417 Baker, m.d.
No. 513 Baker, m.d.
B225H Natco Heavy Duty, m.d.
Model 150 Baker Heavy Duty, m.d.

GEAR SHAPERS

No. 12 and 18 Fellows Gear Shaving Machine, m.d., late
No. 6 Fellows, belt drive
No. 7, 7A Fellows Gear Shapers, belted m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 6I Fellows, belted m.d.
No. 6J Fellows, gear box, m.d.
No. 6IA Fellows, m.d., latest type
No. 64S Fellows, m.d.
No. 64SA3 Fellows, m.d.
No. 70 Cross Chamfer Machine, m.d.
No. 72 Fellows High Speed Spur Gear Shaper, m.d.
No. 75 Fellows High Speed, m.d.
No. 75A Fellows, m.d.
No. 712 Fellows, m.d.
No. 715A Fellows, High Speed Gear Shaper, m.d.
No. 64SA Fellows, m.d.

GEAR CUTTERS

No. 12 Gleason Straight Tooth Bevel Gear Rougher, m.d.
No. 36BM Gould & Eberhardt Spur Gear Cutter
Gleason Spiral Bevel Gear Rougher, m.d.
No. 3—36" Brown & Sharpe Gear Cutter
No. 4B Fellows Gear Burnisher
No. 8B Fellows Gear Burnisher
3" Gleason Gear Generator, m.d.
8" Gleason Gear Generator, m.d.
11" Gleason Gear Generator, m.d.
Cincinnati Gear Burnisher, m.d.
No. 4—48" Brown & Sharpe Spur Gear Cutter, belt
No. 6—60" Brown & Sharpe, m.d.

GEAR GRINDING MACHINES

6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
9" Pratt & Whitney Hydraulic Spur & Helical
No. 13LS Fellows Gear Lapper, m.d.
SG11 Gear Grinding Machine, m.d., latest
GG19 Gear Grinding Machine, m.d., latest
GG31 Gear Grinding Machine, Internal Gear & Spline Grinder, m.d.
10" Pratt & Whitney Model M1639 Single Wheel Gear Grinding Machine, m.d.
18" National Broach Red Ring Gear Lapper, m.d., late

GEAR HOBBING MACHINES

Type A Barber-Colman, m.d.
No. 5AC Lees-Bradner Heavy Type Gear Generator, m.d.
No. 12 Barber-Colman, Double Overarm, m.d.
No. 12 Barber-Colman, Single Overarm, m.d.
No. 34 Brown & Sharpe, m.d., Spur & Spiral
No. 130 Cleveland Rigid Hobber

GEAR TESTERS

No. 1 Brown & Sharpe Spur Gear Tester
12" National Broach & Machine Co.
18" National Broach & Machine Co.
18" Gleason Bevel Gear Tester, m.d.
No. 471 Michigan Tool Co. Hob, Reamer & Gear Checker

AUTOMOTIVE GRINDERS

No. 78 Van Norman Automatic Piston Turning & Grinding Machine, m.d.
Kwik-Way Model H Piston Turning & Grinding Machine, m.d.

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d., Filmatic Spindle
Cincinnati Valve Seat Grinder, cap. 5/8" valve seat, m.d.

CARBIDE GRINDERS

#44 Excello Double End
#49 Excello Double End

CRANKSHAFT GRINDERS

10x60" Landis Universal Type C, m.d., late
22"x72" Landis Type CH, m.d., late

CYLINDER GRINDERS

No. 73 Hoald Airplane Cylinder Grinder, m.d., new
Model FG Micro Cylinder Grinder, m.d.

SEND FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio — MElrose 1241 — CABLE ADDRESS EMCO

A "Live" Stock of 2500 MACHINE TOOLS

Assures you of the *RIGHT* tool for the job... at the *RIGHT* time at the *RIGHT* price

Here Are 8 **RIGHT** Tools* for Sale or Rent

- 42"x42"x10' Rockford Hyd. Openside Planer
- 3A DeVlieg Jig Mill
- 22"x144" Ctr. Lodge & Shipley Lathe
- #4 Warner & Swasey Turret Lathe
- 8", 10", 12" Sundstrand Prod. Lathes
- 7" Table Type Horiz. Boring Mill, Giddings & Lewis
- 36" Bullard (High column)

*** Tell us what you need**

Inquiries . . . INVITED

Write for Catalog

S&S MACHINERY CO.
135 53 St., Bklyn, N.Y.
Hyacinth 2-7400—Cable: Sandstools

HILL-CLARKE MACHINERY COMPANY

CONSULT US ABOUT REBUILDING YOUR OWN MACHINES

AUTOMATICS

Type D 16"-8 spdl. Bullard Mult-Au-Matic
6"-8 spdl. Geo. & deLeeuw Chucker

BORING MILLS

36" Bullard V.T.L.
100" Niles Vertical Boring Mill
Foote-Burt Vert., 5" dia. spdl., 26" sw. (1941)

BORING MACHINES

No. 49 Heald Borematics (1942)

DRILLS

1 spdl-14" sw. No. 2 Avey (1942)
1 spdl-24" sw. No. 2MA-6 Avey
1 spdl-26" sw. No. 4 MS L-G
2 spdl-24" sw. No. 3 Avey (1942)
3 spdl-26" sw. No. 2LMS L-G
3 spdl-24" sw. No. 3MS L-G
3 spdl-24" sw. No. 2MS Allen (1942)
4 spdl-14" sw. No. 2LMS L-G
4 spdl-26" sw. No. 2LMS L-G
6 spdl-20" sw. No. 1LMS L-G
6 spdl-26" sw. No. 2LMS L-G
16 spdl-K66H Fox Multiple, (1941)

GEAR MACHINES

11" Gleason Gear Generator
No. 36BM Gould & Eberhardt
No. 615A Fellows Gear Shaper
No. 612A Fellows Gear Shaper
No. 65 Fellows Cone Drive
No. 12H8 Gould & Eberhardt

GRINDERS

No. HI, 4"x12" Landis Pl. Cyl.
5"x36" Norton Cam-O-Matic (1946)
5"x42" Norton Type C Cam-O-Matic (1941)
6"x18" Norton Type C Plain (1942)
10"x18" Norton Type C (1941)
10"x36" Norton Type C Plain
10"x36" Norton Type C Cam Grinder
10"x48" Norton Type C Plain (1942)
14"x48" Landis Type C Plain
14"x48" Landis Universal
18"x36" Cinc. Model ER Univ. (1942)
16" 26"x72" Norton Plain
18"x120" Norton Type A Plain
20"x96" Norton Plain
20"x32"x144" Norton Gap
20"x192" Norton Type A Plain
24"x264" Norton Type A Plain
42"x72" Norton Pl. (1942)
Hill-Clarke Cylindrical Norton Type M.D.
10"x36" centers 14"x50" centers
10"x72" centers 14"x72" centers
10"x96" centers 18"x96" centers
14"x36" centers 22"x96" centers
No. TG615 J. & L. Thread Grinder
No. 81 Heald Internal Centerless
No. 74 Heald Internal Centerless
No. 72A3 Heald Univ. Internal
No. 72A5 Heald Internal (1942)
No. 72A5 Heald Bridge Type Int.
No. 5 Bryant Internal
No. 5A Bryant Hole & Face
No. 5B Bryant Internal
No. 16-16 Bryant Internal
No. 16A16 Bryant
No. 16-28 Bryant Internal
No. 16A28 Bryant Internal
No. 16F28 Bryant Internal
No. 16-38 Bryant Internal
No. 24-26 Bryant Internal
No. 24-36 Bryant Internal
No. 24L36 Bryant Internal
8" Arter Rot. Surf.
No. R24, 24" Chuck Arter Surface
No. 8 Hanchett Double End Disc
No. 714 Besly Double End Disc

FULL MONEY-BACK GUARANTEE

LATHES

16"x21" Fay Automatic (1944)
16"x32" R-14 Seneca Falls
16 ML 16 LeBlond Semi-Automatic
14"x36" cc Amer. Grd. Hd., M.D.
25"x84" cc Amer. Grd. Hd., M.D.
36"x126" cc Putnam Grd. Hd., M.D.
No. 2 W. & S. Geared Head
No. 5W Acme Universal
No. 7A Jones & Lamson (1942)
No. 1A Warner & Swasey
No. 2A Warner & Swasey
No. 3AL Gisholt Cross Slide Tur.
No. 2H-10 Libby International
No. 4A Warner & Swasey M.D.
No. 4A Warner & Swasey (1944)
No. 4FU Fastermatics, Tur. Type

MILLING MACHINES

No. 36 Van Norman Pl. Swivel Hd. (1941)
No. 4 Cincinnati Dial Type Pl. (1942)
118 Van Norman Hyd. Mfg. (1942)
No. 00 Cincinnati Vertical (1942)
Briggs Mfg. Mill, 30"x8" Table
54"x10" Ingersoll, planer type
54"x30"x16" Ingersoll Slab
10"x60" Pratt & Whitney Thread Model CT Lees-Bradner, 12" spdl hole (1942)

PLANERS

36"x36"x12" Rockford OS planer
60"x18"x27" American, 4 Heads
60"x48"x30" Hamilton, 4 Hds., A.C.

MISCELLANEOUS

No. 11BD 2 Head W. & S. Radial Tapper
No. 5A Kaufman Pneumatic Tapper
15"x18" Dillon Shapers
Model 200 Micromatic Horiz. Hone
No. 224 Barnes Vert. Hone, 4" Cap.
No. 366 Barnes Vert. Hone, 6" Cap.
15 Ton American Hyd. Press
42"-16 ga. Economy Shear, M.D.

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**

EXCELLENT LATE MODEL
USED AND REBUILT MACHINE TOOLS

2⅝" 6 spdl Acme Gridley automatic, 1941
12" x 46" Sundstrand type B auto lathes (2) 1947
7" No. 76H Baird automatic chucker, 1942.
36" and 42" Bullard vertical turret lathes.
No. 5-42 Cincinnati vert. duplex broach, 1946.
10 ton 36" Stroke American 10-T-36 Broach, 1949.
12" x 72" Colonial Broach grinder, late.
5" x 36" Colonial Broach grinder, late.
Models BL2416 & BL3616 Pratt & Whitney Keller Engravers (6), complete with tracers, angle plates & controls.
9' arm 16" Col. American motor-on-arm radial drill.
No. 2 Cincinnati centerless grinder, Filmatic bearings, ser. 2M2H2F21.
4" x 18" Cincinnati pl. hyd. cylindrical grinder, 1946.
6" x 18" Landis "C", 30° head cylindrical grinder, 1941.
6" x 30" Cincinnati "EA" Filmatic plunge cut cyl. grinder "2" 1942-43.
No. 72A Heald hyd. sizematic internal grinder, 1945.
13" x 60" Model 300 Hanchett vert. spdl. surface grinder, late.
No. 3 Barber Coleman Gear Hobbers, (2), Ser. 1336 & 1234.
9" x 18" Hendey tool & gage-maker's lathe, 1940.
14" x 46" Hendey toolroom lathe, 1940.
20" x 67" cc Axelson H.D. engine lathe, late.
26" x 10' bed LeBlond Heavy Duty G. H. engine lathe.
18"/38" x 6' bed Nebel sliding bed extension gap lathe, timken bearings, new 1941.
15" x 30" Lipe Carbomatic hydraulic lathe, new 1942.
17" x 5' bed LeBlond Rapid Production lathe, 1946.
No. 3H Kearney & Trecker plain milling machine, new 1942.
No. 2-18 Cincinnati mfg mill, new 1940
No. 2-20 Kent Owens hydraulic mfg. mill, (2) 1942.
Model M24 Kearney & Trecker Mfg. mill, 1943.
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260 Ton No. 795½—72 Toledo D.C. toggle press.
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545 Ton No. H3612½ Hamilton straight side press.
100 Ton No. 92½ C Toledo S.S.D.C. Press
12" Hendey universal shaper, F.M.D.
8' x 10 ga Bliss power squaring shear

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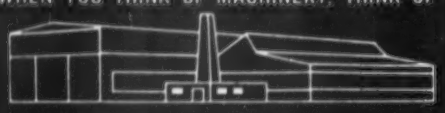

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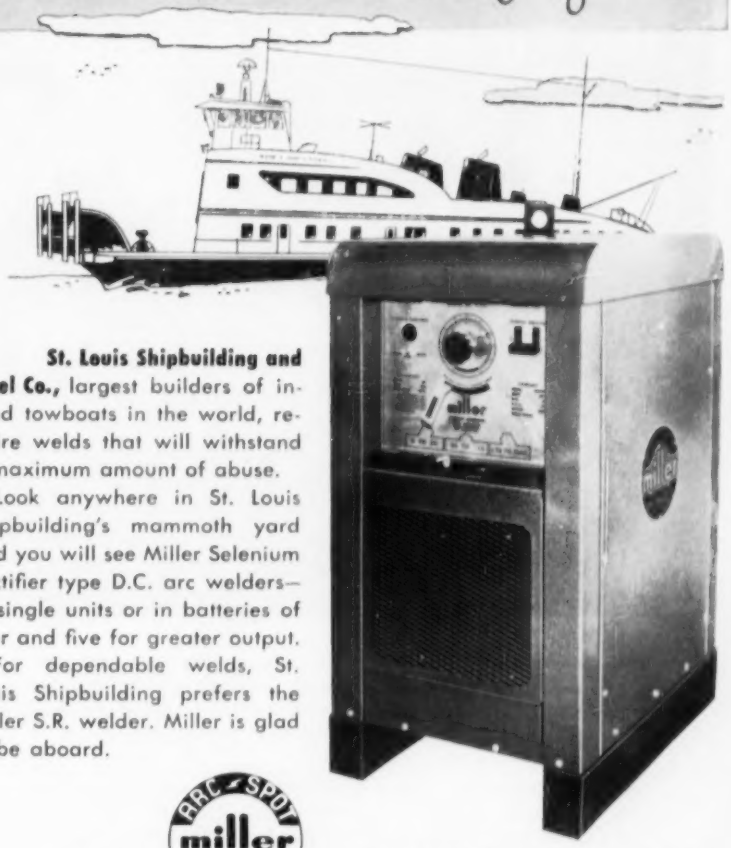

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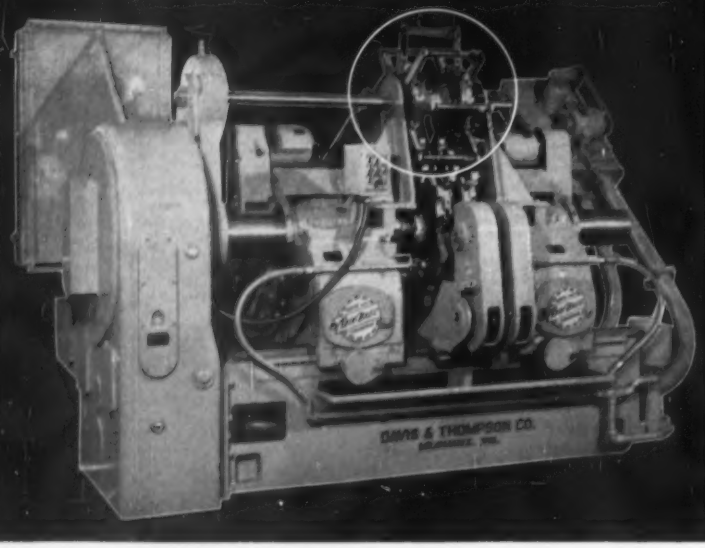

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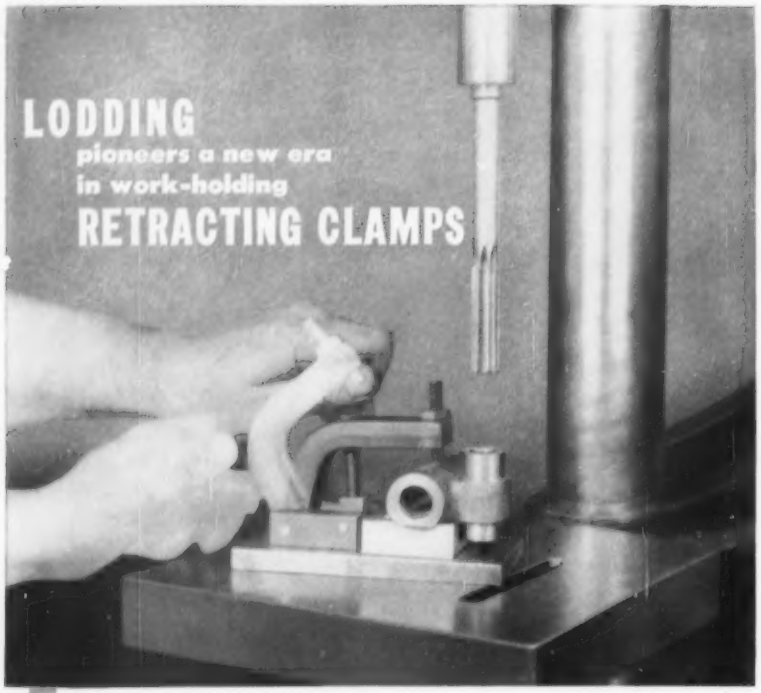

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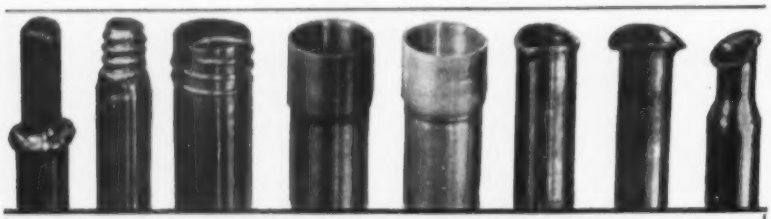

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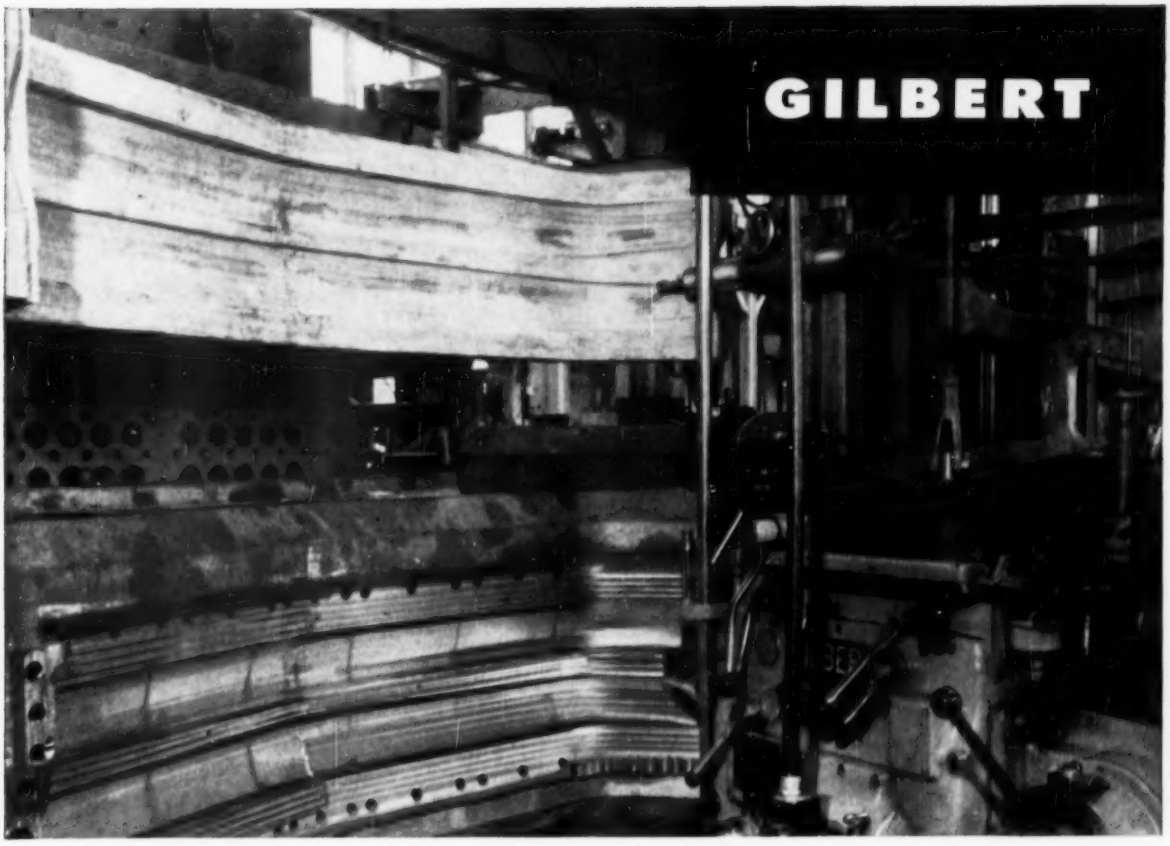

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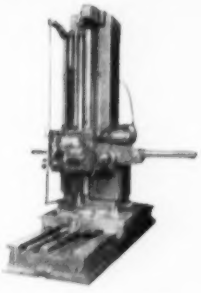

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